ELECTRONICS MANUAL

COMDTINST M10550.25A
JULY 31, 2002

U.S. Department
of Transportation

United States
Coast Guard

Commandant
United States Coast Guard

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COMDTINST M10550.25A
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COMMANDANT INSTRUCTION M10550.25A

Subj: ELECTRONICS MANUAL

1. PURPOSE. This Manual promulgates Coast Guard electronic life cycle policy and selected procedures. This includes guidance on procuring; installing, maintaining and managing supported electronic equipment within the Coast Guard. This Manual also provides guidance for safety information and professional development for the Coast Guard's Electronics Technician.

2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants, Chief Counsel, and special staff offices at Headquarters shall comply with the provisions of this Manual. Internet release authorized.

3. DIRECTIVES AFFECTED. Electronics Manual, COMDTINST M10550.25, is cancelled.

4. DISCUSSION. This Manual has been completely reformatted and extensively rewritten. The changes specifically target streamlining the publication to make it more "user friendly". Because this Manual makes extensive use of hyperlinks, both within the document and to other publications or websites when available, it will be most effective when viewed electronically, although the printed version will still be a viable tool.

    a. The Manual is written utilizing the Information-Mapping? format. This format separates information into small units based on purpose or function for the reader, rather than the topic. It also supports reader scanning, allowing the reader to find pertinent details quickly.

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b. To use this Manual, check the Table of Contents to locate your topic of interest. Turn to the selected section and scan the left-most column of the page for the information you seek. Once the topic is found, the column on the right provides you with the information pertaining to the topic heading. The beginning of each major topic and section provides a Topic table that details what is in this section and its corresponding page. An index is provided at the back of the Manual for ease of use.

5. POLLUTION PREVENTION (P2) CONSIDERATIONS. Pollution Prevention considerations were examined in the development of this directive and have been determined not to be applicable.

6. CORRECTIONS OR CHANGES. This manual will be updated quarterly or semi-annually as appropriate to accommodate changes in the policies, standards, processes, and developing goals of the electronics program. It will keep pace with and present new requirements for electronics support ushered in by the Deepwater Program and National Distress and Response System Modernization Project. All personnel are encouraged to recommend changes or comments to this Manual. Changes shall be submitted in writing to Commandant (G-SCE-2) or via the Commandant (G-SCE-2) website at http://cgweb.comdt.uscg.mil/g-sce/sce-2/10550/M10550.html.

7. FORMS AVAILABILITY. Information on all forms required by this Manual can be found in Section 3.1 Forms, Table 3.1-1.

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Rear Admiral, U.S. Coast Guard
Assistant Commandant for Systems

NOTE

Information contained in this Manual pertain only to electronic systems and do not include the computer systems that comprise Standard Workstation infrastructure.

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Supported Electronic Equipment

Overview

Introduction

The term "supported" in Coast Guard electronics management has many different meanings. There is the concept of centrally supported (spare parts provided by the Federal Supply System), field or fleet level locally supported (ESD or unit's ET has to install equipment which has been procured locally, but is not authorized), and the concept of EIR reported equipment (equipment which is listed in the EIR, regardless of how it was purchased). This section will clarify the definition of supported equipment throughout the Coast Guard.

References

The following references are key manuals when defining supported equipment:

a. U.S. Coast Guard Logistics Handbook, COMDTINST M4000.2 (series)
b. Major Systems Acquisition Manual, COMDTINST M4150.2 (series)
c. Supply Policy and Procedures Manual, COMDTINST M4400.19 (series)
d. Provisioning Manual For Major Systems Acquisitions, COMDTINST M4423.3 (series)
e. Financial Resource Management Manual, COMDTINST M7100.3 (series)

Supported electronic equipment defined

For this Manual, *supported electronic equipment is any equipment that has centralized logistics support*.

The following conditions must be met to qualify an equipment as centrally supported:

?? A SMEF or Equipment Manager is identified by Commandant (G-SCE),
?? An EILSP is developed or under development, and
?? An APL is developed or under development.
OR…
?? The equipment satisfies a Navy requirement (Navy-Type Navy-Owned).

NOTE:

Logistics is a generic term which encompasses all the support activities associated with the developing, acquiring, testing, and sustaining mission effectiveness of electronic systems throughout its service lives. The overall objective is to provide the right personnel, equipment, spares, and information at the right time, place and at reasonable costs.

Non- Supported Equipment

Non-supported electronic equipment is equipment that has not been authorized by G-SC. This electronic equipment is usually purchased with unit or district funds to meet local requirements (e.g.: telephones, additional hand held radios, Personal Emergency Position Indicating Radio Beacon (PEPIRB), unique equipment on non-standard boats, pagers, morale televisions, etc.). Non-supported electronic equipment will be reported as General Purpose Property, recorded in Oracle Inventory Fixed Asset Management (IFAM) and is not supported by Commandant (G-SC).

Supported Equipment/ Unit Configuration

Each unit has a specific configuration, which is the listing of systems/equipment (parent/child). This listing is limited to Commadant (G-SC) supported equipment. This listing is called the Unit Configuration File and it is the basis for the Management Information for Configuration and Allowances (MICA). Units will only receive support for equipment that is listed in their configuration file. Equipment that is not centrally supported is the sole responsibility of the unit and shall be recorded as General Purpose Property in Oracle (IFAM).

Nomenclature requirements

All installed electronic equipment, and related test equipment shall have a nomenclature assigned by the Engineering and Logistics Command (ELC). Electronic general-purpose property being tracked in the Oracle (IFAM) is required to have an assigned nomenclature.

NOTE:

An assigned nomenclature listed on the unit's property records does not mean the equipment is supported.

1.0 Organization

1.0.1 Introduction

The Systems organization of the Coast Guard is a cross-functional matrix organization with a numerous chains of commands, culminating with the Commandant. The reader should note that depot level support infrastructure, including Centers of Excellence, fall under the Systems Directorate (G-S) while the Maintenance and Logistics Command (MLC) falls under the Operations Directorate (G-O) via the Area Commanders. See Organizational tree on next page.

1.0.2 Mission

The responsibility for ensuring the operational availability of the various platforms, facilities and systems within the Coast Guard, resides with the Systems Directorate. The Systems Directorate develops, deploys, and maintains the resources necessary to sustain the capabilities to meet operational requirements that support the five Coast Guard Strategic Goals of Safety, Protection of Natural Resources, Mobility, Maritime Security, and National Defense.

1.0.3 Functional Responsibility

The Systems organization is responsible for the following functional areas:

?? Engineering,
?? Maintenance, and
?? Logistics.

These functional areas are in support of Commandant's (G-O) missions of:

?? Command,
?? Control,
?? Communications and
?? Computers.

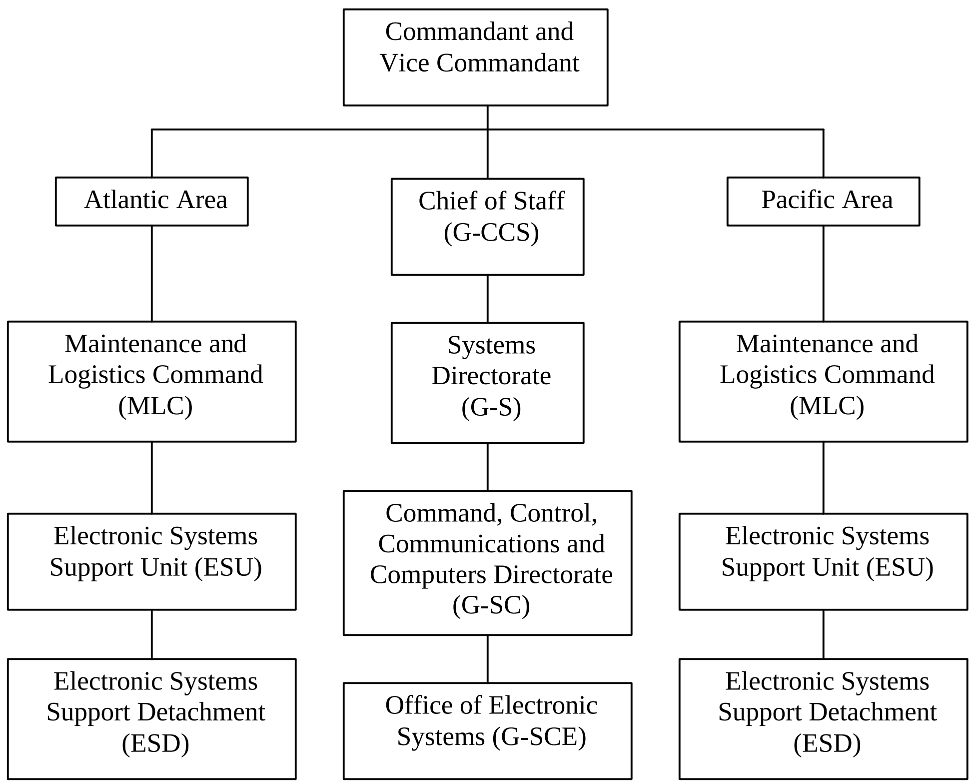
1.0.4 Organization References

The overall Coast Guard organization is set forth in the Coast Guard Organization Manual, COMDTINST M5400.7 (series). The individual element responsibilities are contained in the Coast Guard Organization Manual and the Coast Guard Regulations, COMDTINST M5000 .3 (series).

1.0 Organization, Continued

1.0.5 Organizational Tree

Below is abbreviated organizational tree to show the relationship between the Office of Electronic Systems (G-SCE) and the MLC's.



1.0.6 Contents

This section contains the following topics:

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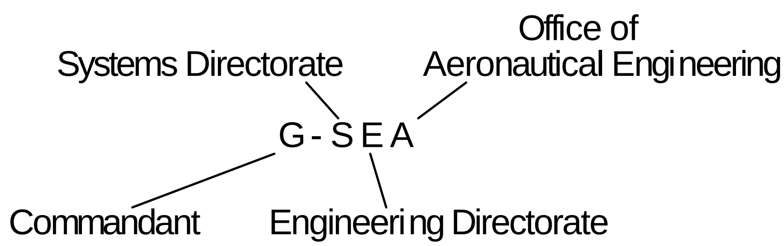
1.1 Headquarters' Directorates & Offices

1.1.0.1 Introduction

Coast Guard Headquarters is functionally broken down into Directorates. Each Directorate is commanded by a Flag Officer or Senior Executive Service (SES) member and further broken into other directorates and then offices.

1.1.0.2 Lettering Convention

Headquarters uses a three-letter designator, prefaced by the capital letter "G" to signify Headquarters.



1.1.0.3 Contents

This chapter contains the following topics:

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1.1.1 Command, Control, Communications & Computers Directorate (G-SC)

1.1.1.0.1 Introduction

The Command, Control, Communications, & Computers Directorate (G-SC) is the support manager for telecommunications, computers, and electronics.

The Commandant (G-SC) is composed of one Director and three offices: the Office of Computer Systems (G-SCC), the Office of Electronic Systems (G-SCE), and the Office of Telecommunications Systems (G-SCT).

1.1.1.0.2 Headquarters Units Under G-SC

The directorate is responsible for several headquarters units:

?? Loran Support Unit (LSU)
?? Command and Control Engineering Center (C2CEN), and
?? Telecommunications and Information Systems Command (TISCOM)

1.1.1.0.3 Contents

This section contains the following topics:

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1.1.1.1 Office of Computer Systems (G-SCC)

1.1.1.1.1 Introduction

The Office of Computer Systems (G-SCC) is responsible for obtaining resources and setting policy for information technology infrastructure. It is divided into two divisions: Hardware Policy and Standards Division (G-SCC-1) and Software Policy and Standards Division (G-SCC-2).

1.1.1.1.2 Business Areas and Responsibilities

Commandant (G-SCC) initiatives are concentrated in three business areas:

?? Hardware/software policy/standards for the Standard Workstation infrastructure
?? Technical advisor to the Chief Information Officer (CIO), and
?? Coordinating, planning, acquisition, administration, and securing resources to support and recapitalize the Standard Workstation infrastructure on a lifecycle basis. The infrastructure includes the core hardware, software and network devices that provide the platform for office automation, e-mail, and Internet connectivity and enterprise-wide applications developed to support the Coast Guard missions.

Policy issues are focused on the Coast Guard-wide use of microcomputer technology. The Standards program focuses on software tools for Standard Workstation and reflects a strong commitment to reduce the cost of microcomputer ownership, and enhance security/reliability/performance. Commandant (G-SCC) has drafted the Standard Workstation Infrastructure Management Plan to ensure that the IT infrastructure is managed and effectively supported thus enhancing the Coast Guard's ability to achieve its goals.

1.1.1.1.3 Relationship to CIO

Commandant (G-SCC) staff maintains a strong partnership with the CIO staff, by participating in working groups, conferences and routine interaction within Headquarters to address Coast Guard-wide information technology issues.

1.1.1.2 Office of Electronic Systems (G-SCE)

1.1.1.2.1 Introduction

The Office of Electronic Systems (G-SCE) is divided into two divisions: Integrated Systems Division (G-SCE-1) and Electronic Systems Support Division (G-SCE-2). Between the two divisions, the procurement (except for major acquisitions) and life cycle management of all supported Coast Guard electronics is conducted.

1.1.1.2.2 Business areas and Responsibilities

The Office of Electronic Systems (G-SCE) is responsible for;

?? Coordinating
?? Planning,
?? Acquisition,
?? Administration,
?? Support, and maintenance of all electronic equipment (less avionics and weapons fire control) in support of all Coast Guard missions.

Commandant (G-SCE) is responsible for

?? Command and control systems,
?? Sensor systems,
?? Long range navigation aids,
?? Short-range electronic aids to navigation,
?? Radio aids, and
?? Remote control and monitor systems.

1.1.1.2.4 As a program manager

Commandant (G-SCE) is the program manager for the Command and Control Engineering Center (C2CEN) and the Loran Support Unit (LSU).

1.1.1.2.5 Integrated Systems Division (G-SCE-1)

The Integrated Systems Division provides policy, planning, support, and technical oversight for the design, development, and procurement of the integrated systems and tactical electronics systems mentioned above. This includes procurement of all electronics (including telecommunications and computer systems for C2 use only) on new ship acquisitions.

Commandant (G-SCE-1) is the entity within the Office of Electronic Systems that evaluates life-cycle support for CG AC&I acquisitions.

1.1.1.2 Office of Electronic Systems (G-SCE), Continued

1.1.1.2.6 Electronic Systems Support Division (G-SCE-2)	The Electronic Systems Support Division provides policy and support for Coast Guard support electronic equipment that has already been fielded. This includes LORAN-C, Differential Global Positioning System (DGPS), and electronic Short Range Aids to Navigation (SRAN).
1.1.1.2.7 Navy Type Navy Owned (NTNO) electronic equipment	The Navy-Type Navy-Owned (NTNO) electronics equipment program manager is located within Commandant (G-SCE-2).

1.1.1.3 Office of Communications Systems (G-SCT)

1.1.1.3.1 Introduction

The Office of Communications Systems (G-SCT) is the program manager for Coast Guard Telecommunications - voice, data, radio, wire, and fiber. Commandant (G-SCT) is made up of two divisions: Telecommunications Planning and Policy Division and Spectrum Management Division.

1.1.1.3.2 Business Areas and Responsibilities

Commandant (G-SCT) responsibilities include:

?? Management,
?? Planning, and
?? Policy for all Coast Guard operated telecommunications systems.

In addition to Management of all Coast Guard Communication Systems, Commandant (G-SCT) is tasked with oversight of Maritime Safety interests before the International Telecommunications Union. Safety services provided to the public is also disseminated via Internet pages. These services provided to public customers also include implementation of the Global Maritime Distress and Safety System, participation on the International Maritime Organizations Radio Communications and Search and Rescue Subcommittee, providing radio safety broadcast and watch keeping schedules, maritime telecommunications rules and regulations, boating safety telecommunications, and other safety information for mariners.

1.1.1.3.4 As a Program Manager

Commandant (G-SCT), as Program Manager, coordinates TISCOM (Telecommunication and Information Systems Command) efforts. These include the Coast Guard Data Network Plus (CGDN+) to provide Wide Area Network (WAN) data services, recap and modernization of HF voice and data networks, and several Commercial and Military Satellite Communications projects to improve long range communications to mobile units, and the VHF-FM Digital Encryption Standard radio recapitalization to enhance short range communications and interoperability with other law enforcement agencies.

1.1.1.3.5 Sponsor

Commandant (G-SCT) is the sponsor for the Advanced Communications Project at the Coast Guard Research and Development Center, exploring new technologies and architectures for the future. Commandant (G-SCT) has drafted the Coast Guard Telecommunications Plan to ensure the portfolio of projects is managed effectively and enhances the ability of the Coast Guard to achieve its goals - protecting people from the sea and the sea from people.

1.1.2 Engineering Directorate (G-SE)

1.1.2.0.1
G-SE Responsibility

The Engineering Directorate (G-SE) provides engineering assistance to all Coast Guard activities, including:

?? Design,
?? Construction, and
?? Maintenance of shore stations/facilities, cutters, boats, aircraft, equipment, and aids to navigation.

The Engineering Directorate (G-SE) is composed of one Director and three offices: the Office of Aeronautical Engineering (G-SEA), the Office of Civil Engineering (G-SEC), and the Office of Naval Engineering (G-SEN).

1.1.2.0.2
Contents

This section contains the following topics:

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1.1.2.1 Office of Aeronautical Engineering (G-SEA)

1.1.2.1.1 Introduction	The Office of Aeronautical Engineering (G-SEA) ensures that safe, properly configured aircraft are available to meet Coast Guard mission requirements in the most cost-effective manner. The Office sets objectives, policies, structures, and responsibilities, and gains resources for the Aeronautical Maintenance Management system. The maintenance management system is a composite of United States Air Force (USAF), Navy (USN), commercial, and United States Coast Guard developed procedures.
1.1.2.1.2 Business Areas and Responsibilities	The Office of Aeronautical Engineering is responsible for establishing logistics and maintenance management policy for the Coast Guard's fleet of fixed and rotary wing aircraft. The Office is also responsible for administering the operating budget for the Coast Guard Aircraft Repair and Supply Center (ARSC) and managing AC&I projects affecting the supportability and capability of all Coast Guard aircraft.

1.1.2.2 Office of Civil Engineering (G-SEC)

1.1.2.1.1 Introduction

The Office of Civil Engineering (G-SEC) plans, designs, procures, constructs, and maintains all Coast Guard shore facilities and visual and audible aids to navigation. Also provides technical support for pollution response hardware and diving equipment.

1.1.2.1.2 Business Areas and Responsibilities

Commandant (G-SEC-1) is responsible for:

- ?? Shore facilities AFC-43 account manager
- ?? Real property manager
- ?? Shore facilities AC&I account manager
- ?? Shore facilities energy policy
- ?? Shore facilities planning
- ?? Shore facilities standards

Commandant (G-SEC-2) is responsible for:

- ?? Signal and power for aids to navigation
- ?? Buoys and structures for aids to navigation
- ?? Pollution response equipment
- ?? Diving equipment

Commandant (G-SEC-3) is responsible for policies relating to:

- ?? NEPA planning
- ?? Historic and cultural assessments
- ?? P-2 recycling
- ?? Hazardous wastes
- ?? Ozone depleting substances
- ?? Environmental stewardship

Commandant (G-SEC-4) is responsible for:

- ?? SFCAM initiative

1.1.2.3 Office of Naval Engineering (G-SEN)

1.1.2.3.1 Introduction

The Office of Naval Engineering (G-SEN) oversees naval engineering policy for all new and existing cutters and small boats as well as environmental policy as it pertains to naval engineering. In addition, the Office of Naval Engineering provides oversight for the ELC and the Coast Guard YARD. The Office of Naval Engineering is made up of three divisions: Program Management Division (G-SEN-1), Projects Division (G-SEN-2), and Environmental Division (G-SEN-3).

1.1.2.3.2 Business Areas and Responsibilities

The Office of Naval Engineering (G-SEN) is responsible for;

?? Coordinating
?? Planning,
?? Acquisition,
?? Administration,
?? Support, and maintenance of all hull, mechanical and electrical equipment in Coast Guard vessels.

Commandant (G-SEN) is responsible for

?? All aspects of the Naval Engineering Program,
?? Technical Direction of the Engineering and Logistics Center,
?? Technical Direction of the Coast Guard Yard.
?? Environmental Policy as it pertains to the naval Engineering program

1.1.2.3.3 Program Management Division (G-SEN-1)

The Program Management Division provides the correct people, funding, policies, guidance, and tools to operate and maintain the fleet. Some specific areas of responsibility include management of the Allotment Fund Control Code-45 (AFC-45) account (funds for ship repair, maintenance, and upgrades), ownership of the Naval Engineering Manual, management of the Engineering Change Process, oversight of the Engineering Officer in Training program, and the Naval Engineering Postgraduate program.

1.1.2.3.4 Projects Division (G-SEN-2)

The Projects Division coordinates naval engineering policy for ongoing major acquisitions of cutters, boats, and support systems. This includes coordinating the review of technical reports, designs, and logistics support plans for these procurements.

1.1.2.3.5 Environmental Division (G-SEN-3)	The Environmental Division actively participates in the development of environmental standards as they apply to Coast Guard vessels. In addition, it effectively implements air and water pollution as well as solid and plastic waste disposal systems to meet environmental standards on Coast Guard vessels.

1.2 Centers of Excellence

1.1.2.0.2 Contents

This section contains the following topics:

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1.2.1 Aircraft Repair and Supply Center (ARSC)

1.2.1.1 Overview

The Aircraft Repair and Supply Center (ARSC), located in Elizabeth City, North Carolina, provides complete logistics support to the entire Coast Guard aviation fleet. This includes:

- ?? Aircraft overhaul and repair;
- ?? Technical engineering support;
- ?? Supply (including inventory management and procurement);
- ?? Parts re-engineering and manufacturing;
- ?? Information services; and
- ?? Personnel who provide on-site field assistance and training for over 200 Coast Guard aircraft at 25 air stations throughout the United States and Puerto Rico.

The air stations depend on ARSC to provide them with support 24 hours a day, 7 days a week.

1.2.1.2 ARSC Organization

At the Aircraft Repair and Supply Center (ARSC), there are four divisions which provide policy guidance, depot maintenance services, field repairs, technical services, contracting support, and inventory management services for the aircraft product lines (HH-60 (Jay Hawk), HH-65 (Dolphin), HC-130 (Hercules), and HU-25 (Falcon Jet)). There are also four support divisions, Personnel, Aviation Logistics, Information Systems, and Engineering and Industrial Support.

1.2.1.3 ARSC Engineering and Industrial Support Division

The Engineering and Industrial Support Division provides aviation-engineering support to all product lines and air stations; manages Reliability Centered Maintenance (RCM), corrosion, and avionics configuration programs; maintains the aviation technical publications; oversee repair and overhaul of aircraft components; and manages Contract Field Teams (CFT) performing aircraft modifications.

1.2.1.4 Information Systems Division

The Information Systems Division maintains computer information applications (Aircraft Maintenance Management Information System (AMMIS) and Aircraft Computerized Maintenance System (ACMS)) which support procurement, inventory management, fiscal accounting, flight operations/qualifications, track and schedule aircraft maintenance, aircraft configuration, avionics components, and provide for technical publication tracking and ordering.

1.2.1.5 Aviation Logistics Support Division	The Aviation Logistics Support Division is responsible for managing $750 million in aviation inventory Coast Guard wide; Allotment Fund Control Code-41 (AFC-41) budget of $200 million; and approximately $90 million in Acquisition, Construction, and Improvement (AC&I) funds per year; and handles 180 contracts valued at $5 million.
1.2.1.6 Personnel Support Division	The Personnel Support Division manages all personnel actions for over 650 military and civilian employees throughout ARSC.

1.2.2 Coast Guard Yard

1.2.2.1 Overview

In 1899, a Baltimore born military officer, LT John C. Moore, petitioned the Revenue Cutter Service (the predecessor of today's Coast Guard) to purchase property southeast of Baltimore harbor. The land was secured, and the YARD became a central location for the Revenue Cutter Service to repair and construct cutters and lifeboats. Until 1910, the YARD was the first home of the Coast Guard Academy, now in New London, Connecticut.

1.2.2.2 Coast Guard Yard Responsibility

The United States Coast Guard YARD is the only shipbuilding and repair facility of the Coast Guard. It is also the Coast Guard's largest, most modern industrial plant. The YARD is responsible for construction, repair, and renovation of vessels and various aids to navigation, and for the manufacturing of miscellaneous Coast Guard equipment.

1.2.2.3 Coast Guard Yard Tenants Commands

The YARD serves as host facility for the Engineering Logistics Center, Activities Baltimore, and Curtis Bay Station. It is homeport for Coast Guard Cutters SLEDGE and JAMES RANKIN.

1.2.2.4 Coast Guard Yard Organization

The YARD maintains an organizational structure that defines responsibilities, authority, and lines of communication for areas that affect product and service quality. Accountability and responsibility for quality rests with all employees.

1.2.2.5 Coast Guard Yard Industrial Management

The Industrial Manager has authority and responsibility for the overall management and coordination of all industrial work; planning and execution of this work using assigned resources; setting priorities with regard to workload balancing, budget, and schedule constraints.

1.2.2.6 **Coast Guard Yard Production Manager**	The Production Manager has authority and responsibility for the supervision of the Project Management Staffs and Shop Supervisors; production coordination and progress monitoring of repair, renovation, and construction projects; directing corrective/preventive action on all problems related to costs, manning, work progress, and material requirements; review, authorization, and release of work orders to production shops. Determining resource requirements for assigned workloads; coordinating the work of cross-functional trades and crafts; determining work priorities and meeting production schedules.
1.2.2.7 **Coast Guard Yard Planning and Marketing Division**	The Planning and Marketing Division has authority and responsibility for supervision of the Electronics/Ordnance Project Management Staff, Industrial Engineering and Management Analyst Staffs; reviewing detailed plans/specifications and preparing estimates and Job Orders for incoming projects. The division is also responsible for recommending efficient manpower levels; preparing and releasing work orders to project staffs; planning and marketing the efficient employment of Full Time Equivalent (FTE) resources for long range workload planning; conducting marketing field visits; providing Contracting Officer Technical Representative (COTR) services to support production.
1.2.2.8 **Coast Guard Engineering and Design Division**	The Engineering Design Division has authority and responsibility for managing and providing engineering services in the fields of Naval Architecture, Marine Engineering, Electrical and Electronic Engineering associated with the construction, modernization, overhaul, conversion, maintenance, and repair of ships and small boats.
1.2.2.9 **Coast Guard Yard Support Management**	The Support Manager has authority and responsibility for overall management and coordination of those functions directly supporting the operations of the YARD. This includes Safety and Occupational Health, Facilities Management, Military Personnel Administration, Public Affairs, Human Resources, Equal Employment Opportunity Office, Legal Office, Security, Exchange and Morale Facilities, Medical Facilities, Dining Facilities and Lodging.

1.2.3 Command and Control Engineering Center (C2CEN)

1.2.3.1 Overview

The Command and Control Engineering Center (C2CEN) was established in June of 1996 as the Coast Guard's "Center of Excellence" for Command and Control systems and for all navigation systems (excluding LORAN-C (Long Range Aids to Navigation)). Located on the Integrated Support Command in Portsmouth, Virginia, C2CEN incorporated many of the functions of the former Electronics Engineering Center (EECEN), with the functions of the Command, Display, and Control (COMDAC) Support Facility and numerous new initiatives, into a new, efficient organization. This organization of over 130 military and civilian members, supplemented by on-site contractors, oversees the systems management and engineering support for new and existing command and control, and navigation systems on all Coast Guard ships and shore stations.

1.2.3.2 C2CEN Organization

The Command and Control Center (C2CEN) is divided into three divisions: Command Support Division, Engineering Division, and Systems Management Division. These divisions provide the structure that allows C2CEN to enable one stop shopping for Command and Control users in the Coast Guard. It also facilitates evolutionary engineering that focuses on the rapid deployment of essential functionality followed by planned improvements based on enhanced or refined requirements.

1.2.3.3 C2CEN SMEF Responsibility

C2CEN is assigned as the System Management and Engineering Facility (SMEF) for the following systems:

- Command and Control Personal Computer (C2PC)
- Computerized American Practical Navigator (CAPN)
- Closed Circuit Television (CCTV)
- Marine Forward Looking Infrared (MARFLIR)
- Navigation Sensors including DGPS Receivers, Direction Finders, Fathometers, and the AN/SPS-73(V) Surface Search Radar (SSR)
- Differential Global Positioning System (DGPS) including Maritime and National Broadcast sites as well as the Nationwide Control Station
- Shipboard Command and Control System for 378’, 270’ and 210’ High and Medium Endurance Cutters (SCCS-378, SCCS-270, SCCS-210)
- Short Range Aids to Navigation (SRAN)
- Vessel Management System (VMS)
- Vessel Traffic Service System (VTS)
- Integrated Shipboard Control System (ISCS) for the 175’ WLM “Keeper” Class Seagoing Buoy Tenders and 225’ WLB “Juniper” Class Coastal Buoy Tenders

1.2.3 Command and Control Engineering Center (C2CEN), Continued

1.2.3.4

C2CEN Points of Contact

In addition to providing maintenance and troubleshooting assistance on its assigned systems that is beyond the scope or capability of the intermediate level, C2CEN provides a point of contact for technical liaison and information through the SMEF Help Desk. SMEF Advisories and other pertinent system and equipment information can be found on C2CEN's Intranet site.

1.2.4 Engineering Logistics Center (ELC)

1.2.4.1 Engineering Logistics Command (ELC)

Located in Baltimore, Maryland, the Engineering Logistics Center (ELC) was established in June of 1996, by merging Supply Centers Baltimore and Curtis Bay, elements of Naval Engineering and Electronic Systems from Headquarters and a portion of the Electronics Engineering Center from Cape May, New Jersey. In a short time the ELC has become a leader for the management of vessel engineering and logistics support. Together with its partners and a workforce of 604 military and civilian personnel, the ELC manages vessel platforms including cross platform configuration for electronic and ordnance systems. ELC manages equipment configurations including:

?? Communication,
?? Navigation,
?? Auxiliary,
?? Propulsion, and
?? Electrical systems providing design and engineering support.

This includes the management and distribution for materiel, directing depot-level repairs, developing, managing, and providing technical and logistical information system support. The ELC also provides critical equipment and support services to specified regional customers.

1.2.4.2 ELC Organization

Organizationally, the ELC is made up of six major divisions in direct support of all Coast Guard afloat and shore operational units. The ELC is responsible for over 40 external products with each product falling into one of three major categories: Parts, Information, and Services. There are three divisions that directly provide external support to the fleet.

1.2.4.3 Platform Management Division (01)	Platform Management Division (Code 01) - The primary/initial point of customer entry to Engineering Logistics Center support. The division implements the support philosophies established by HQ for platforms and implements Logistics requirements in accordance with EILSP's to distribute resources obtained from the (operational) Facility Manager or the Logistics Advocate, as appropriate. Develop and recommend policy and environmental guidance to Coast Guard Headquarters; prepare, manage, and evaluate individual platform engineering logistics programs; manages funds and information for projects; manages and promulgates configuration and allowance information, including item visibility for designated inventory on all platforms and redistribute to meet operational needs. Maintains the ELC's life-cycle costing methodology/equations for the respective platforms, and manages technical information including ownership of all platform related hull, mechanical, electrical, ordnance, and electronic technical information not associated with specific equipment or systems.
1.2.4.4 Equipment Support Division (O2)	Equipment Management Division (Code 02) – Implements the logistics support philosophy (i.e., provisioning) for equipment and systems and obtains the resources necessary to implement the support plans; develops, and recommends policy to Coast Guard Headquarters; performs requisition management; prepares, manages, and evaluates equipment engineering logistics programs to meet platform requirements; and provides ship and system design engineering support as directed and resourced, including maintaining life-cycle costing for systems and equipment. Serves as the owner of all equipment and systems-related hull, mechanical, electrical, and electronic technical information.
1.2.4.5 Material Division (O3)	Material Management Division (Code 03) - Provides warehousing and physical distribution support for a variety of material items that are essential to Coast Guard operational and administrative needs. The division performs all functions necessary for warehousing, which includes onsite receiving, inspection, packaging, and shipment of material. The division manages a retail inventory in support of the Coast Guard YARD and other local commands. In addition, the division manages items in temporary storage/staging projects, coordinates local transportation services, and provides mail service for the entire Engineering Logistics Center and Coast Guard YARD facility.

1.2.5 Loran Support Unit (LSU)

1.2.5.1 Overview

The Loran Support Unit (LSU) in Wildwood, New Jersey, is the Coast Guard's technical support center for the Long Range Navigation (Loran) system currently used for land, air, and maritime use throughout North America. The LSU was established on approximately 520 acres at the southernmost portion of the former Coast Guard Electronics Engineering Center (EECEN) and commissioned as a Headquarters Command on May 16, 1997. The 62 person staff at the LSU is comprised mainly of Coast Guard officer engineers, enlisted electronics technicians, and civilian electronic engineers and technicans.

1.2.5.2 LSU Organizations

The Loran Support Unit is divided into three divisions: Support Division, Engineering Division, and Administration Division.

1.2.5.3 Loran Coordination Efforts

The Loran system in North America includes 29 transmitting stations, 29 monitor stations, and three control stations. International agreements also require we provide support to Canada and Russia, with whom the U.S. shares radio navigation responsibilities across our common land and sea borders. In the spirit of international cooperation, the LSU also interfaces, both operationally and technically, with Loran and communications engineers and specialists in the Netherlands, Norway, Italy, Germany, Iceland, Saudi Arabia, and Japan.

1.2.5.4 Loran SMEF

The LSU is assigned as the Systems Management and Engineering Facility (SMEF) for the Loran system. In addition to providing all maintenance and technical assistance for Loran in North America, the LSU conducts a variety of projects for the Coast Guard and the Federal Aviation Administration to improve existing systems.

1.2.6 Navigation Center (NAVCEN)

1.2.6.1 Navigation Center

NAVCEN under the control and direction of Chief, Office of Aids to Navigation (G-OPN) is a tenant command of TISCOM, Alexandria, VA and provides operational control and guidance for the LORAN-C and Differential GPS programs. The principle mission of NAVCEN is to ensure LORAN-C, and DGPS, provide usable, dependable navigation information to military and commercial users. NAVCEN receives technical guidance and support from Commandant (G-SC), LSU and C2CEN. NAVCEN also operates the Navigation Information Service (NIS) as the primary Coast Guard liaison with the maritime public. The NIS provides timely operational status advisories (including Local Notice to Mariners) and other marine information. Staffed 24 hours a day, the NIS distributes information by a variety of media, including postal mailings, voice telephone, electronic bulletin board, electronic mail, fax on-demand, and an Internet home page. The Boating Safety "1-800" information service, previously located in Coast Guard Headquarters, is collocated with the NIS.

1.2.7 Operations Systems Center (OSC)

1.2.7.1 Overview

The Operations Systems Center (OSC) Martinsburg, located in Kearneysville, West Virginia is the "Center of Excellence" for Coast Guard enterprise application computing. The staff at OSC develops, fields, maintains, and provides user support for major operationally focused information systems and databases. These systems are accessible to the Coast Guard around the clock from around the world. Organizationally, OSC reports to Commandant (G-CIT).

1.2.7.2 OSC Responsibility

OSC develops, fields, maintains, and provides user support for major information systems and databases that are accessible to the Coast Guard, around the clock, from around the world. These systems serve as the information heart of the Coast Guard's search and rescue, law enforcement, marine safety, logistics, national security and personnel support functions. Some of these systems include Automated Merchant Vessel Reporting (AMVER), Law Enforcement Information System (LEIS), Ship Arrival Notification System (SANS), Marine Information for Safety and Law Enforcement (MISLE) and Computer Aided Search Planning (CASP). OSC also provides information system disaster recovery planning and Coast Guard developed software technical support and services. OSC provides certain wide area network operations support and carries out the Automated Information System risk management program for other data centers and major mission-critical software development projects.

1.2.8 Telecommunications and Information Systems Command (TISCOM)

1.2.8.1 Overview

The Telecommunications and Information Systems Command (TISCOM) is located in Alexandria, Virginia, on a site consisting of ten main buildings laid out in a campus setting on over 200 acres about ten miles south of Washington, D.C. TISCOM is an organization of diverse, highly dedicated, and talented professionals committed to developing and delivering cost effective telecommunication and information systems for the Coast Guard and also serves as the home of the Coast Guard's Ceremonial Honor Guard. Other tenant organizations include the Coast Guard Navigation Center and a field office of the Chesapeake Region of the Coast Guard Investigative Service.

1.2.8.2 TISCOM Responsibility

The Telecommunications and Information Systems Command (TISCOM) develops, implements, and supports telecommunications, electronics, and information systems to meet the needs of today's Coast Guard. TISCOM is also the home of the Coast Guard's Ceremonial Honor Guard, whose mission is to provide highly skilled military units to represent the Coast Guard at federal or national ceremonial functions.

1.2.8.3 TISCOM Organization

The Telecommunications and Information Systems Command (TISCOM) organization is divided into three main staff components. Working directly for the Executive Officer, the support staff includes the Personnel Reporting Unit (PERSRU), the Comptroller Division, the Facilities Engineering Division and the Honor Guard Division. The Systems Director oversees the Telecommunications Operations and Engineering Divisions and also the COMMSYS2000/DMS staff. The Information Systems Director is responsible for the Information Systems Operations and Engineering Division.

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1.3 Maintenance & Logistics Commands and Subordinate Units

1.3.0.1 Maintenance and Logistics Commands (MLC) Overview

The Electronic Systems Divisions of MLC Atlantic (MLCLANT) and MLC Pacific (MLCPAC) provide electronics, telecommunications, and information resource management and technical support to their respective area and district units. The MLCs are responsible to their Area Commanders for the proper installation, operation, maintenance, and modification of all electronics, telecommunications and Information Resource Management (IRM) equipment and software. This includes planning, budgeting and management of funds, developing and preparing annual budget submissions to Headquarters in accordance with current directives. MLCs assist areas and district units with installations, alterations, technical expertise, and maintenance needs beyond the unit's capabilities.

1.3.0.2 Contents

This section contains the following topics:

1.3.0.3 Unit request for MLC Assistance

Requests for MLC assistance from districts and headquarters units shall be through the chain of command. The MLCs may also ask assistance from headquarters units through the chain of command. Complete organizational, functional and administrative procedures for the MLC can be found in the respective MLC directives and instructions. MLCs tasking shall include, but is not limited to, supporting electronics, telecommunications and information resource management.

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1.3.0.4 MLC's Supported Electronics

MLCs support all supported electronic equipment and systems on shore and floating units and at non-staffed sites including:

- ?? Communications,
- ?? Command & control,
- ?? Radar, positioning,
- ?? Monitor & control, and
- ?? Navigation systems (e.g., VTS, LORAN, DGPS, ATON, and Beacons).

Support and manage all Electronic Shops (e.g., class A, B, C & D facilities) under A-76 commercial contract support. Support and manage electronics equipment accountability and reporting functions. Acquire, manage and provide calibration support for all area and district General Purpose Electronic Test Equipment (GPETE) and MLC designated Special Purpose Electronic Test Equipment (SPETE). Detailed test equipment requirements are contained in this Manual.

1.3.0.5 Tele-comm systems

MLC's manage and support all telecommunications systems, including but not limited to, area networks, landlines, secure communications and telephone systems at all shore facilities. Support all cryptographic and telephone systems on all vessels.

1.3.0.6 Automatic Data Processing (ADP) Systems

MLC's support all activity within area boundaries relating to Automatic Data Processing (ADP) systems, including training, configuration control, operation, and data resource management.

1.3.1 Electronic Systems Support Units and Detachments

1.3.1.1 Electronic Systems Support Units (ESU)

ESUs are managed and supported by the MLC and provide oversight for the Electronic Systems Support Detachments within the ESUs area of responsibility. ESUs are strategically located to provide quick response to technical problems or assistance requests. ESU services encompass installation, operation, maintenance, overhaul, and modification of all electronics, telecommunications and certain computer equipment and related software.

1.3.1.2 Electronic Systems Support Detachments (ESD)

ESDs are managed and supported by the ESU. ESDs are strategically located to provide quick reaction to technical problems or assistance requests. ESD services encompass installation, operation, maintenance, and modification of most electronics, telecommunications and certain computer equipment and related software.

While these facilities are integrated in the ESU/ESD infrastructure, each facility has different capabilities. The below designations provide a standard method of describing the capabilities of a given facility.

1.3.1.3 ESD Class A facilities

Class A facilities are equipped to install, repair, modify, and overhaul most electronic equipment, certain electronic modules, telephone, teletype, public address, and intercom systems. They maintain a stock of electronic replacement equipment and parts for routine repairs and emergency use. This type facility may also provide minor test equipment calibration and repair. They maintain liaison with local power and telephone companies and may also have capabilities for repairing power, telephone, and submarine cables. This type of facility is usually co-located with an Integrated Support Command where complete major overhauls, refurbishing, and retrofits can be accomplished.

1.3.1.4
ESD Class B facilities

Class B facilities are equipped to install, repair, modify, and overhaul most electronic equipment and systems and certain electronic modules. They maintain a stock of electronic replacement equipment and parts for routine repairs and emergency use. This type facility may also provide minor test equipment calibration and repair. This type of facility is usually co-located with an Integrated Support Command where complete major overhauls, refurbishing, and retrofits can be accomplished.

1.3.1.5
ESD Class C facilities

Class C facilities are capable of installing, repairing, modifying, and overhauling electronic equipment, telephone, teletype, public address, intercom systems and electronic modules not requiring industrial facilities. They maintain a limited stock of electronic replacement parts for routine repairs and emergency use. They may also have capabilities for repairing power, telephone, and submarine cables. This type of facility may be located with a group, communication station, or other unit.

1.3.1.6
ESD Class D facilities

Class D facilities are capable of installing, repairing, modifying, and overhauling electronic equipment and electronic modules not requiring industrial facilities. They maintain a limited stock of electronic replacement parts for routine repairs and emergency use. This type of facility may be located with a group, communication station, or other unit.

1.3.2 Integrated Support Commands and Detachments

1.3.2.1 Integrated Support Commands (ISC)

Integrated Support Commands (ISC) are major commands that are capable of providing a combination of personnel, morale, health care, transportation, storage, facility maintenance, motor vehicle, and industrial support services to units in a specific geographic area. There are three types of ISCs according to the level of support services they can provide: industrial, partial industrial and non-industrial.

1.3.2.2 Industrial Support Detachments (ISD

Industrial Support Detachments (ISD) are facilities under the ISC with industrial capabilities to fabricate, overhaul, apply coatings, and/or other industrial type activities. ISD's are usually located so as to provide industrial support to units within a specific geographic area.

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1.4 Districts & Subordinate Units

1.4.1 Districts

Like the Areas, districts are responsible for operational mission function of the Coast Guard, as opposed to the logistics, maintenance, and support functions of the MLCs. The district provides command and program management for those units assigned. Electronics Technicians and Telephone Technicians assigned to district units provide maintenance and support expertise for the units. To satisfy the electronics support requirements beyond the unit technician's ability, districts depend upon the MLCs and the ESUs for new installations, alterations of existing equipment, and electronics maintenance needs.

Sections are designated regions within a district that, due to geographic separation from the district, have a regional section staff to handle the operations and administration of the units within the section.

1.4.1.2 Greater Antilles Section (GANTSEC)

The Greater Antilles Section is under Seventh District administrative and operation control. The basic geographic organization is defined in United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series).

1.4.1.3 Mariannas Section

Mariannas Section is under the Fourteenth District administration and operation control. The basic geographic organization is defined in United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series).

1.4.1.4 Western Rivers

Western River OPS is under the Eighth District administration and operational control. The basic geographic organization is defined in United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series).

1.4.1.5 Activity

An Activity is a district command that performs multiple missions within a geographical area, such as Vessel Traffic Service, Marine Safety Operations, Captain of the Port, small boat operations, etc.   The Activity Commander provides operational and administrative control of the units within the Activities area of responsibility.

1.4.1.6
Groups

Groups are district units that direct the operation and administration of stations, ANTs, CPBs, WPBs and WLICs. The Group Commander provides operational and administrative control for those units assigned to the Group.

1.4.1.7
Stations

Stations and other district units, under the operational control of a Group or District, perform specific mission functions. To accomplish these functions, stations and units require the maximum operational availability of electronics systems and equipment and usually rely upon the MLC support infrastructure to maintain these systems and equipment.

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1.5 Unit's Electronics Division

1.5.1 Overview

The unit electronic organization is described in the organization manual of each Coast Guard unit. This section does not attempt to provide organizational guidance, but does provide minimum requirements for electronics personnel.

1.5.2 Commanding Officer's (CO) Responsibility

The Commanding Officer, or an Officer-in-Charge (OIC), provides operational support for basic missions of the Coast Guard.

1.5.3 Operations Officer (Ops) Responsibility

The Operations Officer is responsible to the Commanding Officer for the readiness of the department. This includes the general condition of electronic equipment assigned to the unit.

1.5.4 Electronics Material Officer (EMO) Responsibility

The Electronics Material Officer, when assigned, is responsible for the readiness of all electronics equipment and for administration of the electronics support program at the unit level. The EMO responsibilities include:

?? Ensuring that all operators and maintenance personnel follow all prescribed safety procedures.

?? Providing information concerning the capabilities, limitations and reliability of electronics equipment.

?? Collecting and disseminating instructions and directives, which apply to the safety of personnel and maintenance of electronic equipment.

?? Supervising personnel engaged in the maintenance and repair of electronics equipment. The Electronics Material Officer shall make or cause to be made, frequent inspections and tests of the equipment and ensure that timely repair and adjustments to the equipment are made.

Continued on next page

1.5.4 Electronics Material Officer (EMO) Responsibility, Continued

- ?? Scheduling and assigning tasks using Coast Guard Planned Maintenance System (CGPMS) as described in this Manual. Ensuring that the allowance of replacement spare parts as listed in the MICA is current and adequate to support the unit's mission.
- ?? Ensuring modifications to, alterations of, and installations of equipment is performed as required by authorized alterations, field changes, instructions, and improvement programs.
- ?? Preparing initial work requests, reports, and information required for repair and overhaul of electronics equipment.
- ?? Ensuring electronics personnel have received the appropriate formal electronics training required to support installed equipment and systems and arranging such training as required.
- ?? Ensuring and encouraging the continued professional development of electronics maintenance and operations personnel through on-the-job training, unit level training plans and outlines, correspondence courses and formal training, including advanced technical training and technical schools.
- ?? Remaining familiar with Commandant, Area, MLC and District directives and procedures for managing and supporting electronics equipment.

1.5.5 Senior Technician

The senior technician shall assume the duties of the EMO when one is not assigned. The senior technician ensures that tasks within the unit electronics organization are carried out. The senior technician assists the EMO by supervising tasks delegated by the EMO, and by assuming the duties of EMO during an absence.

1.5 Unit's Electronics Division, Continued

1.5.6 Operators and Technicians

Each operator and technician is responsible for being proficient in assigned tasks and being familiar with the duties of their immediate supervisor. Proficiency is achieved through careful study of the equipment, technical manuals, operation manuals, technical bulletins, safety notices, publications and hands-on work. All technicians should be thoroughly familiar with this Manual. Each operator and technician is responsible to follow safety precautions for all equipment they operate or service. All personnel are encouraged to constantly improve their knowledge and abilities. This can be done through on-the-job training, correspondence courses, and off duty studies. Further, all personnel have an obligation to instruct subordinates and foster their professional development.

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2.0 Strategy Planning & Development

2.0.1 Introduction

This chapter provides the vision, mission, and organizational structure to guide the Coast Guard electronics program.

2.0.2 References

a. Coast Guard Organization Manual, COMDTINST M5400.7 (series)
b. Coast Guard Regulations, COMDTINST M5000 .3 (series)
c. Coast Guard Measurement Strategy and Responsibilities, COMDTINST M5224.9 (series)
d. Commandant's Quality Award, COMDTPUB P5224.2 (series)

2.0.3 Vision

To provide outstanding electronic systems, supporting the Coast Guard mission today and tomorrow.

2.0.4 Mission

The United States Coast Guard Electronics community is a key element of the Coast Guard's operational capability. Its mission is to maintain electronic systems and the support infrastructure in an optimum readiness status. Meet today's mission needs, while planning for tomorrow.

2.0.5 Key Success Factors

To achieve mission readiness, Coast Guard unit personnel should focus their efforts on the following key success factors to achieve the desired performance outcomes:

1. Focus on Systems Readiness. We must work to maintain the highest level of electronics equipment readiness to support operational missions.

2. Open Communications and Collaborative Effort. Open communications and teamwork between support and operating units are paramount to success.

3. Seek Performance Feedback: We must continuously seek feedback from throughout the organization (customers, supervisors, peers, etc…) to improve the organization and ourselves.

Continued on next page

2.0.5
Key Success Factors, Continued

4. ***Measures to Improve Results***. We need to identify the right items to measure and then measure them. The feedback we receive from measurements must be used to improve our products, processes, and services.

5. ***Ensure Training and Opportunities are Available***. We must make sure training is available to personnel to fulfill the mission of the unit. We must ensure all personnel are provided the opportunity to achieve their full potential.

6. ***Create and Maintain a Professional Work Environment.*** By providing a culture that is open, honest, and treats all persons with respect, the unit will be able to complete the mission effectively and efficiently and allow people to maximize their potential.

7. ***Ability to Manage Beneficial Change***. The future Coast Guard workplace will be in constant flux as new technology is deployed and processes are improved. Properly managing change is critically important. We need to recognize when change is appropriate and must keep the ability to manage change implementation to minimize risks.

8. ***Expertise in Core Competencies***. By core competencies, we mean those skills, activities, and functions that must be performed by our organization. Relinquishing expertise in core competencies will put the organization at risk. The following skills must be maintained to ensure the Coast Guard can meet mission requirements:
   - ?? Creating and maintaining a safe working environment.
   - ?? Maintaining proficiency in the operation, maintenance, and repair of Coast Guard electronics systems
   - ?? Maintaining proficiency in the management and support of Coast Guard electronic systems.
   - ?? Promoting open communication with all personnel to share our skills and knowledge with each other.

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3.0 Information and Analysis

3.0.1 Introduction

This chapter discusses general information and instructions about the forms and publications used in support of electronics and by electronics technicians.

3.0.2 References

The following publications, (held by units or available for reference through the chain of command), contain authority and information for the use of forms discussed in this chapter.

a. Catalog of Forms, M5213.6 (series)
b. Aids to Navigation Manual - Radionavigation, M16500.13 (series)
c. Naval Engineering Manual, M9000.6 (series)

3.0.3 In this chapter

The following is information discussed in this chapter.

For information on…	**See section…**
Forms	3.1
Publications	3.2

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3.1 Forms

3.1.1 Introduction

The Coast Guard uses many forms to record pertinent information in an orderly manner.

3.1.2 Where to get forms

Many forms are available in electronic format on the Coast Guard Standard Workstation, version 3 (CGSWIII) in the JetForm Filler application. Forms can also be accessed through this website http://www.uscg.mil/hq/g-s/g-si/g-sii/forms/formindx.htm.

For forms not available on the CGSWIII, procedures for ordering blank forms may be found in the Catalog of Forms, COMDTINST M5213.6 (series).

3.1.3 In this section

This section covers some of the various forms you will be expected to complete and includes information on other forms required by this Manual. See the below table for all forms described and required by this Manual.

3.1.4

Table 3.1-1

For information on…			
Form Number	**Title**	**See page…**	**Location**
CG-2588	Radio Direction Finder Calibration Chart	3.1-2	
CG-2920	Current Ships Maintenance Project	3.1-2	JetForm Filler
CG-3029	Small Arms Training Record	4.2-13	JetFormFiller
CG-3307	Administrative Remarks	4.2-13	JetForm Filler
CGHQ-3379	Engineering Change Approval (Cutters)	3.1-4	JetForm filler (CGHQ)
CG-4094	Shore Station Maintenance Report	XXX	JetForm filler
CG-4139	Radio Beacon Field Intensity Measurement	3.1-2	JetForm filler

Continued on next page

3.1.4

Table 3.1-1, Continued

CG-5223	Short Term Training Request (STTR)	4.2-8	JetForm Filler
CG-5288	Weekly Training Plan	4.2-13	JetForm Filler
CG-5289	Departmental Training Record	4.2-13	JetForm Filler
CG-5290	Record of Drills and Exercises	4.2-13	JetForm Filler
CG-5451	Feedback Reports	5.2-101	JetForm Filler
CG-5452	Monthly PMS Schedule	5.2-106	JetForm Filler
CG-5453	Annual PMS Schedule	5.2-106	JetForm Filler
CG-5454	Equipment History Form	5.2-106	JetForm Filler
CG-5682	Engineering Change Request (ECR)	3.1-3	JetForm filler
DD-1348	Issue Release/Receipt Document	3.2-3	JetForm Filler
NAVSHIP-531	Resistance Test Record	3.1-5	
OPNAV 4790/CK	Configuration Change	3.1-4	http://cgweb.elcbalt.uscg.mil/ccf-form.htm

3.1.5 Radio Direction Finder Calibration Chart

The CG 2588, Radio Direction Finder Calibration Chart is not available on JetForm filler. This form must be ordered through the ELC. You can find a copy of this form at the end of this section.

3.1.6 Current Ship's Maintenance Project

The CG 2920, CSMP, shall be submitted to the Engineering Officer for any electronics project involving work items beyond the capacity of the units electronics force. This form is can be found in JetForm filler.

3.1.7 Radio beacon Field Intensity Measurement

The CG 4139, Radio beacon Field Intensity Measurement shall be submitted by any units supporting radio beacons. For more information on using this form, see Page 2 of the form.

3.1.8 Engineering Change Forms

3.1.8.1 Introduction

With the limited resources the Coast Guard operates under, we must ensure we buy the right equipment and install it in the most efficient manner possible. The Engineering Change Request (ECR) process is one method we use to ensure this happens. A more thorough explanation of the ECR process can be found in Section 5.2.7. This section only discusses the forms used in the process.

3.1.8.2 Starting an ECR

All Engineering Changes shall be initiated through the submission of an ECR. An ECR may originate at any organizational level by completing the form CG 5682 found in JetForm Filler.

3.1.8.3 Detailed instructions

For detailed information and instructions on using this form, refer to the Naval Engineering Manual, COMDTINST M9000.6 (series), Chapter 041 and Coast Guard Configuration Management, COMDTINST M4130.6 (series).

3.1.8.4 Platform Engineering Change

A Platform Engineering Change is a modification to a shore unit, cutter or standard boat that changes stability, hull structure or compartmentation, mission characteristics/capability, or out-fitting requirements specified on approved Allowance Equipage Lists (AEL).

3.1.8.5 System Engineering Change

A System Engineering Change is an engineering change that does not meet the criteria of a Platform Change but does cause a change to any system component or subassembly that is documented on a Allowance Parts List (APL), to an approved system software, fluid, or paint system, a form, fit or functional change to a closure or fitting, or damage control classification change.

3.1.8.6 After the Engineering Change, form 3439A

After completing the Engineering Change:

Step	Action	Send…
1	Enter the appropriate information in the "Completed" section of the Engineering Change Authorization (CGHQ 3379)	?? One signed copy to the ELC. ?? One signed copy to the servicing MLC. ?? One signed copy to Commandant (G-SCE).
2	If your unit is MICA/CALM supported, then…	Configuration Change Form (OPNAV 4790/CK) to the ELC.
3	Update CMPlus.	

3.1.8.7 CGHQ 3379

CGHQ 3379, the Engineering Change Approval form is used to document approval, for each unit, for a given Engineering Change. The form is used by the unit to notify the support infrastructure the Engineering Change has been completed. This form can be found in JetForm filler under CGHQ forms.

3.1.8.8 OPNAV 4790/CK

OPNAV 4790/CK, the Configuration Change Form is used to notify the ELC of any change to a unit's configuration. Submitting this form ensures your MICA will be updated and the unit will be issued the appropriate spares. This form can be found on the ELC website at http://cgweb.elcbalt.uscg.mil/ccf-form.htm.

3.1.9 NAVSHIP-531: Resistance Test Record

3.1.9.1 Purpose

The Resistance Test Record card provides information on the condition of all transmitting and receiving antenna systems and submarine cables. This includes antennas, insulators and transmission lines.

3.1.9.2 Safety

Ensure you observe all safety precautions outlined in Chapter 4, "Human Resource Focus".

3.1.9.3 Using separate cards

A separate NAVSHIPS-531 card is used to record the measurements of each segment of the transmission line and antenna network.

3.1.9.4 Testing procedures

Refer to Chapter 5.2.6, Maintenance, for complete testing procedures.

3.1.9.5 Unusual observations

Any conditions or situations peculiar to a test on any line or antenna should be noted on the card in the "Remarks" section.

3.1.9.6 Test interval

Coast Guard equipment should be inspected and tested on a regular basis. Use the chart below to determine the maximum interval for testing your equipment.

If the equipment is…	then test the equipment at least…
on a shore unit	quarterly.
on a floating units	monthly.
a submarine cable	annually.

3.1.9.7 Testing without an ET assigned

Shore and floating units which do not have an electronics technician assigned should be tested by the responsible repair facility.

3.2 Publications

3.2.0.1 Introduction

This chapter contains general information on the allowance, requisitioning and procuring publications of interest to Coast Guard electronics personnel.

3.2.0.2 References

The following publications are the authority for the information in this section.

a. Standard Distribution List, COMDTNOTE 5605
b. Directives, Publications and Reports Index, COMDTNOTE 5600
c. Electronics Material Identification Manual, ELCINST M4410.5 (series)
d. Electronics Installation And Maintenance Book (EIMB), NAVSHIPS 0967-000-0000
e. Navy Stock List of Publications and Forms, NAVSUP 600d (series)

3.2.0.3 In this section

In this section, the following material is discussed:

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3.2.1 Publication Distribution and Ordering

3.2.1 Automatic distribution

Normally, required publications are distributed automatically to users. General information regarding the distribution, allowance and procurement of publications can be found in the Directives, Publications and Report Index, COMDTNOTE 5600. Publications are distributed to the addresses listed in the Standard Distribution List, COMDTNOTE 5605.

3.2.2 Requests for allowance change

Recommendations for allowance changes shall be submitted to Commandant (G-CIM) via the unit's regular chain of command. The MLC/district commander will consider the needs of all units of a type in evaluating the request.

3.2.3 Change of unit address

If a Change in the address of a unit is required, form CG-4183, CHANGE OF MAILING FREIGHT AND BILLING ADDRESS, should be submitted according to directions on the form.

3.2.4 Additional publications

In general, procurement of publications is at the discretion of the commanding officer, subject to restrictions and procedures imposed by the chain of command. If more copies of a publication are needed than are normally distributed or if a publication is needed that is not routinely distributed it should be requisitioned using procedures discussed in this section. Requests for extra copies of publications are considered one-time actions and automatic distribution of subsequent amendments and changes will not be made, unless CG-5323, REQUEST FOR ALLOWANCE CHANGE, is submitted and approved.

3.2.5 Required publications

Refer to the Directives and Publications Index, COMDTNOTE 5600 for final authority as to which publications your shop or unit is required to have on hand. Steps should be taken to obtain any required publication, which are not being held by your unit. If a publication is not required but would prove useful to technicians, order it by submitting Form CG-4428 to the stock point as listed in Directives, Publications and Report Index, COMDTNOTE 5600 or locate it online at http://isddc.dot.gov/.

Continued on next page

3.2.6 Required publications, Continued

The size and mission of a particular unit will determine whether publications are:

- ?? Required
- ?? Not required but could prove useful and may be acquired
- ?? Not required and of no special interest

3.2.7 New equipment manuals

Electronic Equipment technical manuals are considered a part of the equipment and each new equipment, when installed, comes with two technical manuals.

3.2.8 Obtaining new manuals

The Engineering Logistics Center (ELC) Baltimore, MD stocks Coast Guard electronics technical manuals for Coast Guard type and commercial type electronics equipment. Submit requisitions to the ELC. The manuals will be issued on a non-reimbursable basis. Use DD-1348 (2-PT), DoD Single Line Item Requisition System Document. Procurement of publications from other agencies shall be made in accordance with other sections of this chapter.

Submit requisition for ELC Baltimore catalogs and stock lists to the ELC. The catalogs and stock lists are issued on a non-reimbursable basis. Use form DD-1348.

3.2.9 DoD Publications Website

For on-line access to all DoD specifications, standards, instructions, directives and handbooks, go to www.dodssp.daps.mil.

3.2.2 Electronics Material Identification Manual (M4410.5)

3.2.2.1 Electronics Material Identification Manual

The Electronics Material Identification Manual, ELCINST M4410.5 (series) provides identifying information for components, assemblies, and equipments required to support or report shipboard and shore-based electronics systems in the Coast Guard Supply System. The manual is divided into eight parts to facilitate dissemination of instruction and information to cognizant electronics and supply personnel. Specific instruction on the use of each part is contained in each of the eight publications.

3.2.2.2 Ordering the complete manual

The manual is available electronically through NE-TIMS.

3.2.2.3 PART I

Part I is the Coast Guard Peculiar Electronics Equipment Nomenclature Cross-Reference. It is a two-part listing of all electronics equipment stocked in the CG supply system.

3.2.2.4 Part II

Part II is the Coast Guard Peculiar Electronic Components Description Guide, a two part listing of general components and tools not normally listed in the Allowance Parts List (APL. An APL is a completed list of all parts in specific electronic equipment and a list of allowable items. Each part is cross-referenced to a National Stock Number (NSN). APL's are prepared for Navy equipment by the Navy Ships Parts Control Center (SPCC), Mechanicsburg, PA, and for Coast Guard equipment by the ELC.

3.2.2.5 Part III

Part III is the Coast Guard Electronics Engineering Technical Publications index. This is a two part listing of Electronics Manuals, Schematics, and Field Change Bulletins.

3.2.2.6 Part IV, CG Peculiar Electronic Components Price List	Part IV lists all CG cognizance electronics and general material stocked at ELC.
3.2.2.7 Part V, Stock Number Change Bulletin	This part lists the stock number changes affecting ALL electronics and general material under cognizance of the ELC in both OLD and NEW NSN cross-references.
3.2.2.8 Part VI, APLs for Supported Equipments	A listing in equipment model number or nomenclature sequence of all APLs for Coast Guard equipment with current publication dates.
3.2.2.9 Part VII, Equipment Description Cross-reference	A listing to correctly identify electronics equipment for reporting in the AIM/EIR.
3.2.2.10 Part VIII, the Hazardous Material Listing	This index identifies Coast Guard peculiar electronics component parts and equipments, which contain or are suspected of containing POLYCHLORINATED BIPHENYLS (PCB). Items containing this substance require special storage and handling, and are disposed of as hazardous material.

3.2.3 Other Military Publications

3.2.3.1 Introduction

The Coast Guard, to a great extent in electronics, utilizes Navy publications. Refer to the Directives Publications, and Reports Index, COMDTNOTE 5600 (series) as final authority for all publications which your shop or unit is required to have on hand. If a publication is not required but would prove useful to technicians, requisition it in accordance with applicable paragraphs of this section.

3.2.3.2 NAVSUP 600d

Navy electronics publications are indexed in the **Navy Stock List of Forms and Publications** (NAVSUP 600d). NAVSUP 600D is a valuable tool for obtaining stock numbers and identification data for Navy technical manuals, field changes, Placards, etc. Units not having NAVSUP 600D should request to be put on the SDL. This Form can also be ordered using this stock number NSN 0530-lp-011-0540 or with internal internet access use the website below and enter the P2003 database. For access to on-line navy forms, see this website: www.nll.navsup.navy.mil.

Hosted by: Naval Supply Systems Command
5450 Carlisle Pike
Mechanicsburg, PA

For technical questions only, email the Naval Logistics Library Customer Service Center or call Toll Free: 866-817-3130.

3.2.3.3 Ordering COG I publications

Cognizance Symbol I (COG I) publications are issued on a non-reimbursable basis from the Naval Publications and Forms Center. Use the following address:

NAVPUBFORMCEN
5801 Tabor Avenue
Philadelphia, PA.

Use form DD-1348. Requisitions for publications are free issue (no fund code required) and can be shipped to different address. See the table below for the appropriate code to enter in the Signal Code box.

If you want the publication shipped to the activity listed in block…	Then use signal code…
10	D
15	M

3.2.3.4 Laminated Placards

Standard laminated placards listed in Section XIII of NAVSUP 2002 are available from the NAVPUBFORMCEN, Philadelphia. Placards are issued on a reimbursable basis and a fund code is required on each requisition (DD-1348).

3.2.3.5 Army or Air Force publications

In general, request for Army and Air Force publications will be forwarded to the Commandant (G-CMA) for review and approval. Order using form DD-1149 as an enclosure to the requesting letter. The procurement of Air Force publications by aviation units will be in accordance with the current Aviation Technical Note concerning aircraft maintenance publications.

3.2.3.6 DoD Index of Specifications and Standards (DODISS)

Department of Defense Index of Specifications and Standards (DODISS), is a complete listing of all DoD approved specifications, standards, and handbooks including industry and association standards approved for use by DoD and Federal agencies. Naval pubs are available online at www.dodssp.daps.mil/, DODSSP, The Department of Defense Single Stock Point for Military Specifications, Standards and Related Publications. Copies of specifications, standards, and handbooks listed in the DODISS may be ordered utilizing form NFPC 4120/6 (REV 2-88) from:

Naval Publications & Forms Center
Code: NPODS
5801 Tabor Avenue
Philadelphia, PA 19120-5099.

3.2.4 Handbooks

3.2.4.1 Introduction	Handbooks provide general information on specific subjects.
3.2.4.2 MIL-HDBK-188, comms systems	MIL-HDBK-188 and MIL-HDBK-188/3, is a guide for developers and users of the Communications Systems Standards (MIL-STD-188 (series)). It identifies handbooks, standards, and specifications applicable to communications systems installations. It also identifies and gives addresses for various industry standard associations (e.g.: ANSI, IEEE, EIA, SAE ...).
3.2.4.3 MIL-HDBK-216, RF lines & fittings	The MIL-HDBK-216 (series), RF Transmission Lines and Fittings provides pertinent information on RF cables, RF connectors, waveguides, and fittings that include physical and electrical characteristics, important assembly techniques and fabrication precautions, and connector adapters. Cable and connector type numbers are listed and may be cross-referenced to NSNs in the MCRL.
3.2.4.4 MIL-HDBK-232, Red/Black installation	MIL-HDBK-232, Red/Black Engineering-Installation Guidelines, provides minimum standards for installation of secure and non-secure information systems.
3.2.4.5 MIL-HDBK-419, grounding, bonding & shielding	MIL-HDBK-419 Grounding, Bonding And Shielding For Electronic Equipment And Facilities. Provides basic information, techniques and procedures, and methods for checking electronic systems and facilities grounding, bonding and shielding.

3.2.5 Standards and Specifications

3.2.5.1 Introduction

Standards provide detailed information, installation techniques, or specific applications of one particular item or subject i.e.;

3.2.5.2 Soldering

The MIL-STD-1460, Procedure for Soldering Electrical connections and Printed Wiring Assemblies, lists all materials, tools, preparations, techniques, and training requirements for electronics soldering. It also includes illustrations and visual standards for checking the quality of the connections.

Also see MIL-STD-1460, Procedure For Soldering Of Electrical Connections And Printed Wiring Assemblies.

3.2.5.3 Grounding, bonding & shielding

MIL-STD-188-124, Grounding, Bonding And Shielding For Common Long Haul/Tactical Communications Systems, establishes minimum basic requirements and goals for grounding, bonding, and shielding ground based electronic transmitting facilities.

See also MIL-STD-1310G, Shipboard Bonding, Grounding, And Other Techniques For Electromagnetic Compatibility And Safety or MIL-STD-1857, Grounding, Bonding, And Shielding Design Practices.

3.2.5.4 Standards for parts

The MIL-STD-242, Selected Standards For Electronic Equipment Parts, lists common standards for resistors, capacitors, fuses, microcircuits, and so forth. Part numbers listed in the detailed specifications may be crossed referenced to NSNs.

3.2.5.5 ANSI standards

There are a series of standards published by the U.S. Commerce Printing Office that consists of a series of internationally accepted installation standards. Among these are ANSI/TIA/EIA-568A, ANSI/TIA/EIA-569A, and ANSI/TIA/EIA-570A.

3.2.5.6 Specifications

Specifications provide detail information as to salient characteristics or methods of manufacture required to produce one item or class of items. Specifications often list military part numbers that may be cross-referenced in the MCRL-1 TO NSNs. For example;

MIL-I-23053/15A Insulation Sleeving, Electrical, Heat Shrinkable Polyolefin, Heavy-wall, Coated, Flexible, Outer Wall Cross-linked. Describes two classes of heat shrink tubing that have an adhesive/sealant liner, which seal the enclosed area when the tubing is shrunk. It also lists a series of Military part numbers I; M23053/15-101-0 which may be cross-referenced in the MCRL-1 to NSN 5970-01-255-8990.

3.2.6 Commercial or OGA Publications

3.2.6.1 Introduction

Occasionally you may need to obtain publications printed by other government agencies or non-government entities. In electronics, the pace of research and development exceeds the government's ability to evaluate and promulgate policy concerning specific areas. Technicians and managers are encouraged to stay abreast of the latest information and make recommendations to the chain of command for to leverage pertinent developments.

3.2.6.2 Other government agency publications

No cost publications issued by other government agencies (OGA) and not distributed by the Commandant may be obtained in limited quantities from local offices of such agencies. Publications available from the Government Printing Office are obtained directly from the

Superintendent of Documents
Government Printing Office
Washington, D.C. 20401

Use form OF-347, *Order for Supplies or Services/Request for Quotations* and charge this expense to your allotted funds.

3.2.6.3 Commercial publications

Commercial publications are used extensively in Coast Guard electronics. However, electronic reference books are not normally stocked in the Coast Guard or Navy Supply system. Reference books may be procured from local commercial supply sources chargeable to allotted funds.

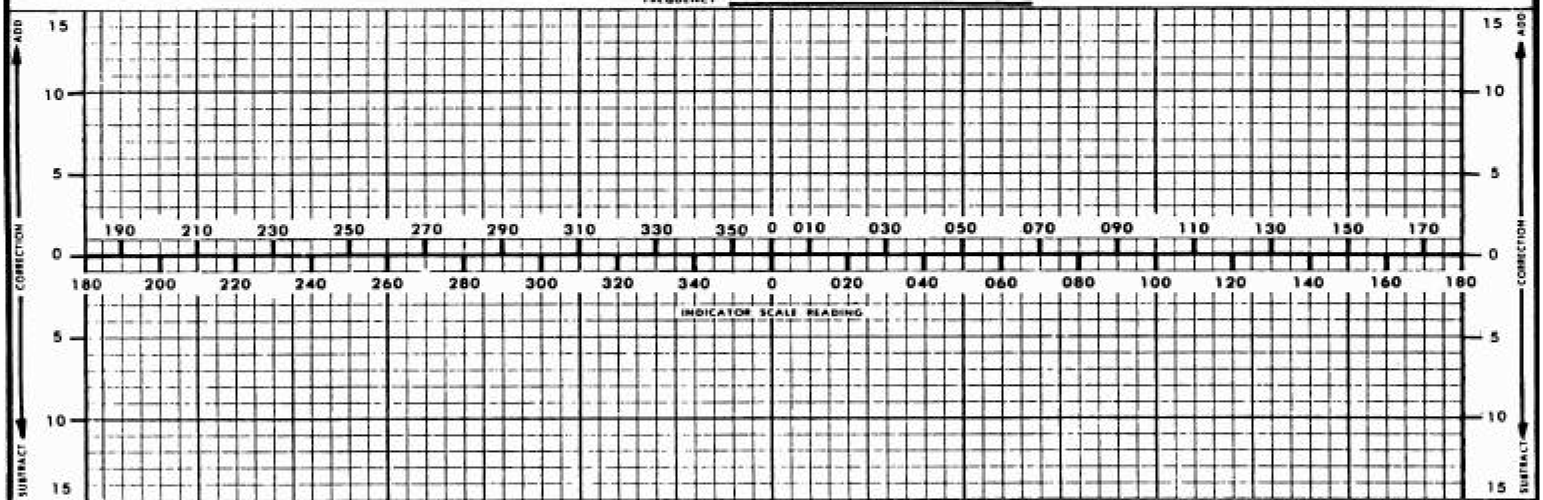
DEPARTMENT OF TRANTPORTATION
U.S. COAST GUARD
CG-2588 (Rev. 8-80)

RADIO DIRECTION FINDER CALIBRATION CHART

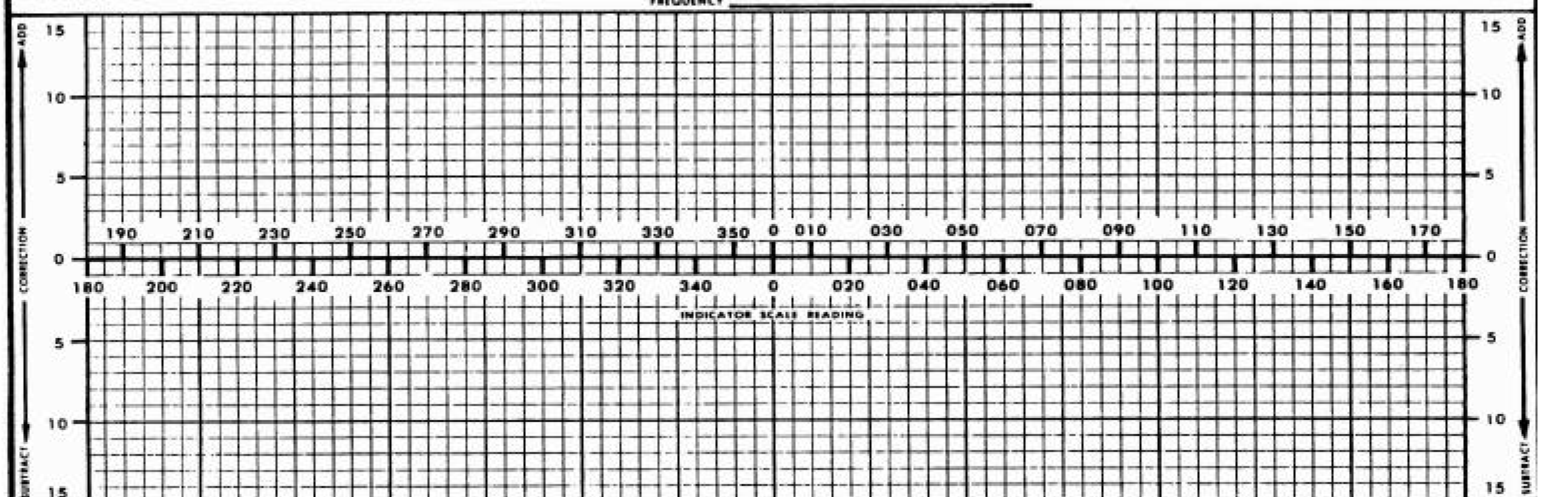
UNIT	DATE	D/F TYPE	SERIAL NUMBER

CONDUCTED BY	APPROVED BY (Commanding Officer)

FREQUENCY ____________________



FREQUENCY ____________________

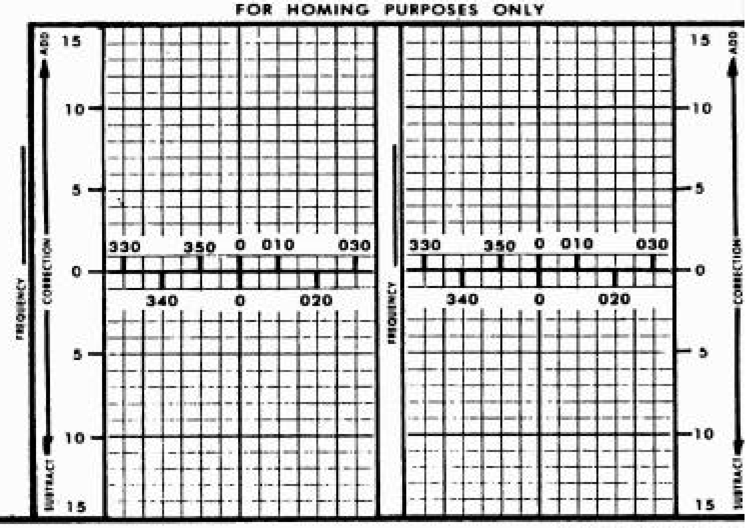


RADIAL ACCURACY CHECK: GOOD ☐ BAD ☐

DATE ____________, BEARINGS ____________________

STANDARD CONDITIONS DURING D/F OPERATIONS

FOR HOMING PURPOSES ONLY



PREVIOUS EDITIONS ARE OBSOLETE

7530-00-F01-1460

4.0 Human Resource Focus

4.0.1 Overview

This section focuses on protecting and developing the Coast Guard's most valuable resource – our people. In Safety, the enterprise wide processes to avoid injury are expressed, including radiation. Professional development is provided to assist you, the reader, in developing to your full potential.

4.0.2 Objectives

This section is intended to address the following key areas:

?? Safe work environment
?? Employee support climate
?? Career progression
?? Training & education
?? Employee knowledge base & capabilities

4.0.3 Contents

This section contains information on the following topics:

Back to Table of Contents

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4.1 Safety

4.1.0.1 Introduction

Above all else safety and health precautions and policies for electronic personnel are our most important considerations.

4.1.0.2 References

The following Commandant Instructions (COMDTINST) and other publications contain safety and health instructions.

a. Coast Guard Organization Manual, Chapter 2, COMDTINST M5400.7 (series)
b. Safety and Environmental Health Manual, COMDTINST M5100.47 (series)
c. Enlisted Performance Qualifications Manual, COMDTINST M1414.8 (series)
d. Shipboard Regulations Manual, COMDTINST M5000.7 (series)
e. Naval Engineering Manual, COMDTINST M9000.6 (series)
f. Hazardous Waste Management Manual, COMDTINST 16478.1 (series)
g. Handling and Disposal of Polychlorlneated Biphenyls (PCB), COMDTINST 16478.2 (series)
h. Coatings and Color Manual, COMDTINST M10360.3 (series)
i. Tower Manual, COMDTINST M11000.4 (series)
j. Shore Confined Space Entry, COMDTINST M5100.48 (series)
k. Permit Required Confined Space, OSHA 29 CFR 1910.146
l. Non-Permit Required Confined Space, Telecommunications NAVORD OP-3565, VOLUMES 1 and 2, Electromagnetic Radiation Hazards to Personnel, Fuel and other flammable material, OSHA 29 CFR 1910.268
m. Safety Precautions for Shore Activities, Chapter 15, Electricity and Electronics General, NAVELEX 0967-LP-624-6010NAVSO P-2455

4.1.0.2 References, Continued

n. Electric Shock – Its Causes and Its Prevention, NAVSHIP 250-660-42
o. Electric Shock and Its Prevention, NAVSHIP 250-660-45
p. Electric Plant-General, Section II, Electrical safety Precautions, Navy Ship Technical Manual (NSTM), Chapter 300
q. Electronics, Section V, Safety, NAVSHIP Technical Manual, Chapter 9670
r. Electronics Installation and Maintenance Books, Section III, Safety NAVSHIP 0967-000-1000
s. Radio Frequency Radiation Hazards, NAVSHIP 0900-005-8000
t. Plastic sheet, laminated decorative and nondecorative, Federal Specification L-P-508H, Type I
u. Adhesive, Bonding Vulcanized Synthetic Rubber to Steel, Federal Specification MMM-A-121
v. Matting or Sheet, Floor Covering Insulating for High Voltage Application, MIL-M-15562F
w. Personnel Protection, Protective Footwear, ANSI-Z41, American National Standard Institute (ANSI)
x. Safety color code for marking physical hazards, ANSI-Z53.1
y. Modeling and Measurement of Electromagnetic Fields near LORAN-C and OMEGA stations, 15 July 1987 (a report by EC Corporation to G-CSP)
z. Measurement and Hazard Assessment of Electromagnetic Fields onboard US Coast Guard Cutters 31 March 1988 (a report by EC Corporation to G-CSP)
aa. Protection of DoD Personnel from Exposure to Radio frequency Radiation and Military Exempt Lasers. Encl: 4, 5, 6, 7, DODINST 6055.11

NOTE

The information contained in this chapter is applicable to all Coast Guard units and is particularly directed toward electronics personnel. It is basic in nature and not all-inclusive. The continuous cooperation and vigilance of all personnel is needed to ensure that operating procedures and work methods do not expose personnel to injury or cause damage to property. In the event that **safety precautions** contained herein conflict with those contained in other publications this chapter shall take precedence.

4.1.0.3 Contents

This section contains the following topics:

Back to Table of Contents

4.1.1 Safety Responsibility

4.1.1.1 Command Responsibility	Commanding Officers are solely responsible for the safety and health of their personnel. CO's shall issue such orders as deemed necessary for the safety of personnel under their command. They shall require that electronics material officer, electronics technicians, and other personnel who are authorized to engage in electronic repair and maintenance work be thoroughly familiar with the basic safety instructions of this chapter.
4.1.1.2 Unit Safety Officer Responsibility	The Safety Officer is responsible to insure safety and equipment familiarization training classes are held for all new reporting personnel prior to their operating or performing maintenance on any electric or electronic equipment, and shall insure that semi-annual classes are held there after. A current OSHA form 2219 will be posted.
4.1.1.3 Unit Supervisor Responsibility	Supervisors shall be familiar with the references in this chapter and ensure safety and health precautions for working areas are strictly observed. They shall ensure the proper rubber floor matting is placed around electronic or electrical equipment suitable hazard warnings are posted, and personnel are trained in the current methods of first aid and resuscitation. In addition, supervisors shall make certain their personnel know the location and proper use of all safety devices, particularly the following: shorting probes, rubber protective gloves, equipment power switches, and power line circuit breakers. Supervisory personnel are responsible, through the chain-of-command, to the Commanding Officer.
4.1.1.4 Unit Technical Personnel Responsibility	Personnel who do the actual repair and maintenance work must realize that they are protecting themselves from injury or possible death by constantly thinking of safety. All personnel shall be thoroughly familiar with this chapter. The printing of precautions and rules on safety is of no value unless the precautions are known, understood and followed.

4.1.2 Protective Equipment/ Safety Devices

4.1.2.1 Safety Equipment

To prevent electrocution or shock injury, certain types of safety equipment are required. Every technician shall be thoroughly familiar with this equipment. Proper stowage and accounting is important to ensure that this equipment is always in ready-to-use status.

4.1.2.2 Personal Fall Arrest System

This system consists of approved full body harness, deceleration lanyard, connecting device, and climber safety devices installed on permanently mounted top side ladders, masts, kingposts, and other similar topside structure providing access to a hazardous location, where a person is expected to wear a safety harness and as described in the Tower Manual, COMDTINST M11000.4 (series). Full body harness must meet ANSI Z359.1-199 requirements and have a “D” ring, which is centered in the wearer’s upper back. The harness must be sized to the individual. The full body harness must be rated for all arrests. Connecting devices include deceleration lanyards, working lanyards, and ladder safety climbing device. Shock absorbing fall restraint lanyards (also called deceleration lanyards) must meet ANSI Z359.1-1992 and ANSI A10.14.1991. These devices limit free fall to 6ft. The shock-absorbing portion of the lanyard must be attached closest to the wearer’s body. The overall length of the lanyard is limited to 6ft. Ropes, straps and webbing used in lanyards, lifelines and strength components of body harnesses shall be made from synthetic fibers. Harnesses constructed of leather or other materials are NOT authorized and shall not be used. The approved harness may be procured directly from the supply system using the following stock numbers: Parachute Harness (NSN 9G 4240-01-421-0859), Safety Line (NSN 9G 4240-00-022-2521), and Safety Harness (NSN 9G 4240-00-022-2518).

4.1.2.3 Shorting Probe

A shorting probe shall be located conspicuously and conveniently in all spaces where electronic equipment is installed. It shall be rated at 25,000 volts (NSN 5975-01-029-4176).

4.1.2.4 Rubber Floor Matting

Rubber matting shall be installed in open spaces around electronic or electrical equipment on board ship and at shore facilities. The matting shall not be covered in any way by materials, waxes, rugs, etc. Seams between matting will be sealed following manufactures instructions. At a minimum, seams will be sealed with 4” wide 3M electrical insulating tape. Additional runner type strips of the same style matting should be placed over permanently installed floor matting in front of workbenches, switchboards or panels. This will aid in preventing quicker wear and tear along high traffic areas that compromise the insulating properties of the matting. The matting must be in compliance with MIL-M-15562D. Commandant (G-SEN) approves the type of floor matting used in the Coast Guard. Currently two types of matting, which comply with MIL-M-15562D, are approved for use where covering for an entire space is required. Exercise care to ensure that moisture, dust, metal chips, etc., don’t collect on the matting; remove them at once to prevent damaging the matting and reducing its insulation value. Matting that cracks, tears, or otherwise deteriorates must be replaced. Testing of rubber matting, if done, should be in accordance with ASTM D178 or manufacturer’s instructions.

Products complying with MIL-M15562D are available using the following stock numbers:

Color	Unit of Issue	NSN
Blue or Marbleized Blue	RO, 3ft x 75ft	9Q 7220-00-267-4630
Green or Marbleized Green	RO, 3ft x 75ft	9Q 7220-00-913-8751
Black	RO, 2ft x 75ft	9Q 7220-00-255-0765

Table 4.1-1 Rubber Floor Matting Stock Information

4.1.2.5 Rubber Gloves

Rubber gloves are to be rated for use in handling apparatus or working with voltages less than 5,000 VAC to ground. Gloves should be frequently inspected and replaced if visual inspection reveals any cracks, cuts, blisters, chemical damage, etc per ASTM D120. Trapping air inside the glove and squeezing the glove to increase the pressure of the trapped air can detect pinhole air leaks. Discard gloves if they indicate any air leaks. Store gloves in the original boxes in a conspicuous place near where used; or they may be stored, unfolded, in a canvas glove bag along with the leather protectors. Stow the gloves away from direct sunlight, steam pipes, radiators and other heat sources, and in a location that is free of ozone. Check with your local safety officer for more information on ozone sources. The below listed NSN's are 14" total length with a 4" gauntlet cuff gloves for use by men and women. Ordering information for higher electrical rating gloves of 7,500 VAC and 17,000 VAC are shown.

Size	VAC Rating	NSN
Size 9	7,500	8415-01-158-9449
	17,000	8415-01-158-9446
Size 10	7,500	8415-01-158-9450
	17,000	8415-01-158-9447
Size 11	7,500	8415-01-158-9451
	17,000	8415-01-158-9448

Table 4.1-2 Rubber Gloves Stock information

4.1.2.6 Glove Shells

Glove shells universal sizes, NSN 9D 8415-00-264-3618, are leather protector gloves, which are to be worn over rubber gloves as a protection against abrasive wear, tears and punctures.

4.1.2.7 Goggles

These coverall-type safety goggles, NSN GSA 4240-00-052-3776, are all plastic, consisting of a flexible frame of molded plastic with plastic lens.

4.1.2.8 Face Shield

Face protective shield, NSN GSA 4240-00-542-2048, size No. 4, 10 x 18 inches. This face shield is a clear plastic, headgear type with crown protector. It protects the face when cutting, grinding, or when handling hazardous liquids. Shields purchased from other than the provided GSA source may be utilized as long as size requirements are met.

4.1.2 Protective Equipment/ Safety Devices, Continued

4.1.2.9

High Voltage Signs

Listed NSN's are provided for posting at appropriate places both afloat and ashore.

Size	Color	NSN
10 x 14 inches	Blk/Wht/Red, fiberglass for inside/outside use	9905-01-050-7960
7 x 10 inches	Blk/Wht/Red, steel with a baked enamel finish for inside/outside use	9905-00-971-7168

Table 4.1-3 High Voltage Signs Stock Information

4.1.2.10

Multi-Powered Source Equipment

Any equipment that has more than one power source (a power source is to be any equipment with 12V or more) shall be labeled indicating multiple power sources as per NSTM Chapter 300. This labeling plate shall be affixed to the equipment in a conspicuous place.

4.1.2.11 Smoke, Pipe Gases Warning

Smoke Pipe Gases Warning sign is made of steel with baked enamel finish, size 10 x 8 ½ inches. The wording on the sign is shown below.

DANGER

Personnel are cautioned to guard against poisonous effects of smoke pipe gases while servicing equipment aloft. When servicing equipment in the way of smoke pipe gases use oxygen breathing apparatus and a chest telephone or throat microphone set for communication with others in working party. Obtain necessary equipment before going aloft.

4.1.2.12 Warning Plate for Electronic Equipment Installed in Small Craft

This sign shall be displayed in all spaces where there is a possibility of the accumulation of explosive vapors, such as fuel vapor, paint fumes, cleaning primers, and battery gases. This sign may be obtained, using standard MILSTRIP procedures, from Naval Supply Depot, Philadelphia. When ordering, specify NAVSHIP Drawing no. RE l0A 589. The wording on the sign is shown below.

WARNING

Do not energize electronic equipment until ventilation blowers have been operating a minimum of five minutes to expel explosive vapors.

4.1.2.13 Safety Tag

The Safety Tag is a 7-1/2 x 4 inch cardboard tag, with an attached cord. The wording on the tag is shown below.

"Do Not Throw Switch, Men at Work on Circuits"

4.1.2.14 Antenna Protection

Protection cages shall be grounded and placed around antennas or antenna lead-ins where personnel might possibly come in contact with the electrical hazard. Radiating antennas ashore shall have single gated fence constructed of non-conductive material installed to completely enclose the immediate area around the base of the transmitting antenna or tower. Appropriate High Voltage warning signs shall be displayed immediately next to or on these protective cages and fences. Coatings and Color Manual, COMDTINST M10360.3 (series) shall be referred to for proper lettering and color markings used with electronic and electrical equipment.

4.1.3 General Safety Practices

4.1.3.1 Overview

Safety and protective equipment must be available; its use is mandatory. Safety precautions must be taken to prevent a dangerous situation from developing when repairing or adjusting electrical and electronic equipment.

4.1.3.2 Trained Personnel

Only trained and competent personnel shall be permitted to work on electrical or electronic equipment. Personnel working with electrical or electronic equipment shall be fully informed of the hazards inherent in such equipment. They shall receive proper instruction in accident prevention and training in CPR and first aid procedures.

4.1.3.3 Do Not Work Alone

Never work on electronic equipment by yourself. Have another person (safety observer) qualified in CPR and first aid present at all times. The safety observer shall also know which circuits and switches control the equipment, and shall be given instructions to pull the switch immediately if anything unforeseen happens. It is a good practice to notify persons in authority of the location of repair or maintenance work, the equipment being worked on, and approximately how long it will take to complete. Keep your supervisor informed, report when you begin and complete a job.

4.1.3.4 Clothing and Jewelry

No loose or wet clothing shall be worn. Clothing with exposed metal zippers, metal buttons or fasteners shall not be worn. Thin-soled footwear or footwear with exposed metal parts or hobnails shall not be worn; instead, non-conductive shoes meeting the requirements of ANSI Z41 shall be worn when working on live electrical circuits of 30 volts or more. Metal rings, watches, bracelets, dog tags, metal-framed eyewear or similar metal items shall not be worn within four feet of exposed energized circuits.

4.1.3.5 Personnel Protective Equipment

Personnel protective equipment such as electrically insulating shoes, electrically insulating gloves, eye and face protection, aprons, etc., shall be worn as appropriate.

4.1.3.6 Damp Locations

Do not work on energized electrical or electronic equipment when hands or clothing are wet, or if the deck or floor is wet. Body resistance and matting resistance are greatly reduced when wet.

4.1.3 General Safety Practices, Continued

4.1.3.7
Wire Safety

Insulate all wires and lead-ins. Never allow energized bare wires to be located in close proximity to flammable fuels or chemicals or in the path of personnel. Keep screw threads, label plates, hinges, etc. on electrical fittings free from paint to maintain electrical contact and to keep information readable. The use of metal pike poles, pruning poles, or ladders in the vicinity of energized open wires or antennas is not authorized.

4.1.3.8
Antenna Safety

Never lean against or grasp an antenna, touch a radio or television antenna lead-in, or touch antenna lightning arrestor while in contact with electrical ground. When operating vehicular equipment, never pass under power lines where an antenna on the vehicle would not have adequate clearance.

4.1.3.9
Electrical Markings

Most injuries and fatalities caused by energized electrical equipment are attributed to human failures. Some of the major causes for such accidents are:

?? Failure to observe posted safety precautions;
?? Installing unauthorized equipment modifications;
?? Using unauthorized test equipment for repair work;
?? Failure to immediately repair unsafe equipment even after a small shock has been received;
?? Failure to test the equipment after repair to determine if it is safe to operate;
?? Failure to remove unused or obsolete cabling and equipment hardware upon completion of new installations or field changes.

4.1.3.10
High Voltage

Safety practices shall be observed when working in the vicinity of high voltage circuits, ship's riggings and structures where Radio Frequency (RF) voltages may be induced.

4.1.3.11 Shore Confined Space

A confined space is a space, which has any one of the following characteristics; limited openings for entry an exit, unfavorable natural ventilation and not designed for continuous worker occupancy. Under ground communications maintenance holes, crawl spaces under buildings among others are considered Confined Spaces. Units that access any confined space are required by Shore Confined Space Entry, COMDTINST 5100.48 (series) to have in place a Unit Confined Space Policy. Specific OSHA requirements are also in place and shall be followed. Entry and supervisory personnel shall be trained for Confined Space entry and work. MLC (k) and cognizant ISC's are primary sources for training and Confined Space entry policy.

4.1.3.12 Working Aloft

Obtaining permission from the Officer Of the Deck (OOD) prior to going aloft for any reason is mandatory. This allows the OOD to notify the radio and radar operators to suspend radiation, the engineering watch to minimize stack gas, and other units in the immediate vicinity to do likewise. In addition, it permits the OOD to notify "all hands" to stay clear of deck areas where men are working aloft and to beware of falling objects, such as tools. Common practice is to have a "man aloft chit" signed by the OOD and other supervisory personnel. Further guidance for climbing of radiating (Hot) towers including Hot Loran towers can be found in the Tower Manual, COMDTINST M11000.4 (series).

4.1.3.13 Wearing Safety Harnesses

No one shall be permitted to go aloft without wearing and properly using the Coast Guard approved safety harness. The harness shall be checked before use to make sure that the webbing, buckles, "D" ring, tail line and snap hook are in good condition. The safety harness is worn as if it were a vest. While ascending or descending the ship's mast and while going through the mast rigging and structure, the harness snap hook shall be progressively clamped on to a firm closed-loop-hold, such that it is impossible for the snap hook to slip off. Closed-loop mast ladder rungs, closed-loop pipe railings, etc. are safe holds to clamp the snap hook. While ascending and descending, you must keep three points of contact (one foot, one hand, the fall arresting device). When aloft in the work area, keep the snap hook clamped to a firm hold. The Commanding Officer shall be informed of any unsafe rigging condition that exist.

4.1.3.14 Tag-Out/Lock-Out Procedures

Equipment Tag-Out Procedure, COMDTINST 9077.1 (series) describes a standardized tag-out procedure for Coast Guard cutters and boats, which is then further customized to tailor to each unit. This procedure shall be used to ensure the safety of personnel and to prevent improper operation of systems or equipment when the system or equipment is isolated or in an abnormal condition because of preventive maintenance or a casualty. Locking out is the preferred method of safeguarding against inadvertent operation of the switch. Tag-Out tags can be found in Equipment Tag-Out Procedure, COMDTINST 9077.1 (series).

NOTE

The procedures described above and in the applicable COMDTINST may be applicable for all units. **However, when conflict occurs OSHA requirements shall take precedence.**

4.1.3.15 Circuit Breakers and Disconnect Means

For power and lighting circuits, the safety rule is to use one hand only for switching. Keep the other hand clear behind you. Before closing switches or breakers, make sure that:

- The circuit is ready and all parts are free;
- Proper fuses are installed for the protection of the circuit;
- All personnel in the immediate area of the circuit to be energized are notified;
- Only one switch or breaker is touched at a time; and
- The face is turned away while closing the switch or breaker to avoid possible eye injury from flashover.

4.1.3.16 Interlocks and Safety Devices

Safety devices, overload relays and fuses shall not be altered or disconnected except for replacement. Safeguard circuits shall not be modified without specific authority. Periodic tests and inspections shall be made to ensure that safety devices are functioning properly.

4.1.3.17 Working with Circuit breakers

The covers on fuse boxes and other types of wiring equipment and accessories shall be kept securely closed except when work is being done on them. Use proper fuses and never bridge a fuse. Never replace a fuse with one of higher amperage rating without proper authority.

4.1.3.18 Working on Energized Circuits

Prior to touching a capacitor, which is, connected to a de-energized circuit, short circuit the terminals and the case to ground using a shorting probe. For capacitors that are entirely disconnected, including those from spares, short the terminals with a suitable insulated lead. Capacitors in storage may accumulate a static charge. Larger capacitors have a shorting wire across their terminals, in most cases.

> **DANGER**
>
> A residual charge may remain in a capacitor. After the power has been turned off, momentarily grounding or shorting the terminals of a filter capacitor may not be sufficient protection. Although the capacitor will be discharged immediately after shorting the terminal, a re-charge may develop in a short time. The re-charge can be large enough to cause injury when leads are connected for testing. Use caution and be sure that no residual charge remains in the capacitor. Hold a shorting bar on the terminals for 30 seconds or more and then test for residual voltage with a voltmeter.

Continued on next page

4.1.3 General Safety Practices, Continued

4.1.3.18 Working on Energized Circuits, Continued

Repair and testing of energized circuits shall be done only when absolutely necessary. Use rubber gloves. Often in the repair of equipment, the use of external test equipment may be required. Personnel making tests shall be fully aware of the dangers involved. All work shall be supervised and performed by qualified technicians, following all safety procedures. Ample lighting, insulated hand tools, and insulated floor matting are necessary for safety. Use one hand only, whenever possible. Never make tests or adjustments on equipment in a position that prevents free exit. Never wedge yourself into a place that you cannot quickly get out of, such as between a steel bulkhead and a piece of equipment, or with arms and shoulders inside an access door. When equipment voltages of **30 volts** or more are to be measured, the following steps in proper sequence shall be followed:

Step	Action
1	De-energize the equipment to be tested.
2	Attach appropriate warning tags and install lockouts.
3	Before connecting any measurement device, you must discharge capacitors using an approved "safety-shorting probe". Attach ground clip of measuring device first.
4	Secure measurement probe to the test point.
5	Make sure controls of the measurement device are in proper configuration for the voltage level and polarity being measured.
6	Stand on a rubber mat away from equipment under test, but in a position to read the measurement device.
7	Energize the equipment under test and make the measurement.
8	De-energize the equipment under test.
9	Discharge high voltage capacitors.
10	Remove the test leads.
11	Repeat the above steps for each measurement, as applicable.

4.1.3.19 Portable Electric Tools

Electric tools improperly used or maintained can cause serious injury or death. To avoid shocks, portable tools shall be properly grounded. Trained personnel for safe electrical and mechanical operation shall test tools quarterly. Clean out any dirt and chips, all ventilating holes should be clear for proper cooling. Replace worn or defective brushes, brush holders, springs, on-off switch, power cord, etc. Old or hardened grease should be removed with approved solvents. The tools should be lubricated with the proper type of new grease. The commutator may be smoothed with fine sandpaper. Never smooth commutators with metallic dust abrasives or emery cloth. Where practical, work on commutators and slip rings (actually the entire motor section of the tool) should be performed under the supervision of the electrical department. After performing any repair work on electrical tools, they shall be tested for safe electrical and mechanical operation.

4.1.3.19.1 Electric Drill Safety Precautions

When operating portable electric drills, observe the following:

?? Make certain the work to be drilled is clamped securely in a vise or otherwise suitably secured.
?? NEVER drill parts while holding them in the hand.
?? Avoid undue pressure on drills.
?? Use a good center punch to mark the point to be drilled.
?? Keep hands away from rotating drill bits.
?? Never drill through partitioning without checking for hidden wires or other obstructions.
?? Hold drill as nearly perpendicular as possible to the work.
?? Make certain no person is close to the other side of the partition unless assisting with the work and would, therefore, be aware of all factors in relation to the job and be able to take steps to guard against possible injuries.

4.1.3.20
Hand Tools

Hand tools shall be properly maintained, since the use of defective tools can cause accidents. Insulate pliers handles with sleeving when they are to be used on electronic or electric equipment. Use handles on files. In areas where sparking is to be avoided, use only non-sparking tools. Defective hand tools that cannot be repaired or sharpened shall not be used. Defective tools shall be properly surveyed and new tools requisitioned.

4.1.3.21
Workbenches for Energized Electronics Equipment

Electronic workbenches, including new installations shall meet or exceed the standard outlined below. Existing workbenches may be replaced or modified to conform to these standards. The materials listed in this table 4.1-1 are not all-inclusive. Substitute materials may be used, but must meet listed military or federal specifications. Application of workbench requirements to specific situations requires discretion and good safety judgment. The safety officer and the shop supervisor shall make resolution of the most practical and safe workbench installation through a joint effort.

Continued on next page

4.1.3.21 Workbenches for Energized Electronics Equipment, Continued

Electronic workbenches for both ship and shore units should be of a modular-type construction such as in drawing No. NAVORD 63-A-114 (Figure 4.1-1). Wood construction is only acceptable for shore units. When longer workbenches are required, modules may be joined together to construct a workbench of the desired length; however, no more than one Auxiliary Table Assembly, unit 63-A-114D5 should be used between cabinet assemblies. Unit 63-A-114D3, Cabinet Base Assembly, is optional for use with the new cabinet assembly. Its use aboard ship is recommended to minimize damage to the cabinet assemblies from buffers, etc. Drawer pulls and hinges shall be made of nylon, and attached using only nylon hardware or cement conforming to Federal The deck surrounding electronic workbenches shall be covered with electrically insulating material complying with standards for floor matting discussed previously in this chapter.

4.1.3.21.1 Electronic Workbench Construction

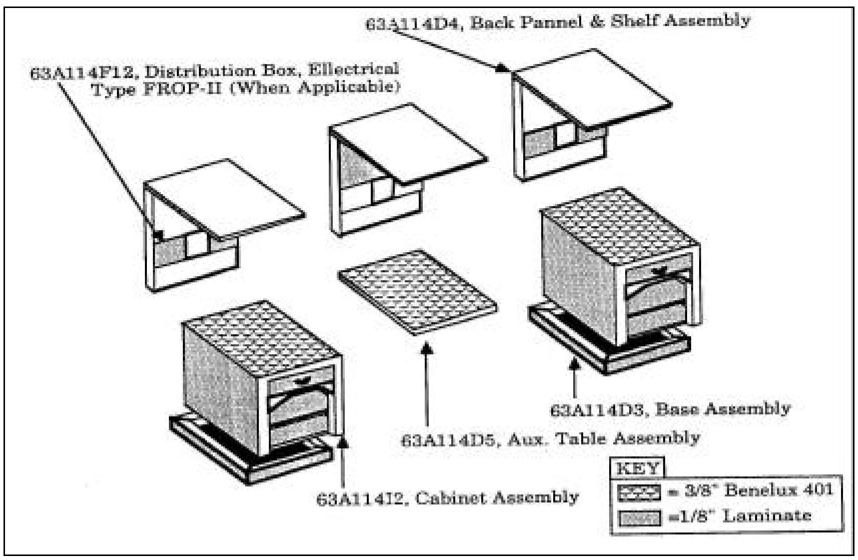


Figure 4.1-1 Electronic Workbench Construction

4.1.3.21.2 Workbench Surfaces

Surfaces of workbenches having conductive material shall be insulated as follows:

- ?? The top working surface shall be equivalent to the insulating requirements of the MILITARY STANDARD (MILSTD) MIL-M-24330 (SHIPS)" Insulation Sheets, Electrical, Ligno-Cellulosic, High Density, Hardboard" (Benelex 401),
- ?? The material shall be a minimum of 3/8-inch thick. Insulation over metal shall be installed as a single piece and shall be secured to the working surface with countersunk 1/4 x 20 nylon screws.
- ?? Insulate the top edge, front edges, and door and drawer fronts, which a person might contact while performing normal work at the workbench, with minimum 1/8-inch Arboron.
- ?? Secure the insulation to the fronts and edges with countersunk 1/4 x 20 nylon screws or cement conforming to Federal Specification MMM-A-121.
- ?? Insulate exposed sides, kneeholes, and other surfaces which a person might contact while performing normal work at the bench with a high pressure laminate
    - o (Normal 1/8 inch) conforming to Type I of MIL-P-1717C (SHIPS) or Type I of Federal Specification L-P-508H.
- ?? Secure the insulation to the surfaces with countersunk 1/4 x 20 nylon screws or cement conforming to Federal Specification MMM-A-121.
- ?? When applying insulation, take care not to defeat the purpose of the insulation by attaching vises, locks, hasps, hinges, or other hardware with metal through-bolts to the metal parts of the workbench. The national stock numbers listed in Table 4.1-1 for materials to be used for construction and insulation of electronic workbenches is not all-inclusive. Other materials may be substituted; however, substitute material shall conform to any listed military or federal specifications.

4.1.3.21.3 Electronic Workbench Materials

MATERIAL	SIZE/QUAN	NSN
Insulation, Arboron	3/8-in	5640-00-256-5195
Laminate, High Pressure Fed Spec L-P-508H	0.062”x4’x8’ Linen Green 0.062”x4’x3’ Charcoal	9330-00-784-0311 9330-00-990-3432
Laminate High Pressure, MIL-T-1717	0.062”x2’x4’ Light Gray 0.062”x2’x6’ White	9339-00-531-0811 9330-00-257-3683
Cement, MMM-A-121	Pint Quart Gallon	9Q-8040-00-273-8717 9Q-8040-00-165-8614 9Q-8040-00-843-3461
Screw, Nylon ¼-20x3/4”	Hundred	9Z-5305-00-543-5733
Cabinet Assembly	EA	IN-6625-00-851-2156
Cabinet Base Assembly	EA	IN-6625-00-851-2157
Back Panel Assembly	EA	IN-6625-00-851-2158
Auxiliary Table Assembly	EA	IN-6625-00-851-2159
Electrical Distribution Box Assembly	EA	IN-6610-00-839-8026

Table 4.1-4 Electronic Workbench Materials

4.1.3.21.4 Electrical Wiring

Electrical wiring to permanently installed workbenches shall be installed in accordance with NAVSHIP requirements, and conform to the National Electrical Code. A ground buss with suitable attachment cables shall be provided to ground equipment at workbenches. The ground buss shall be connected to the fault protection subsystem (green wire ground) but only at the earth electrode subsystem. Exposed metal parts of the workbench, which could become energized by contact with live equipment, shall be similarly grounded through the fault protection subsystem.

4.1.3.21.5 Workbench Extras

- ?? Impedance between neutral and fault protection subsystem (green wire ground) when measured with a ground impedance tester shall be less than 0.5 ohm. Impedance between ground buss and fault protection subsystem shall be less than 0.1 ohm.
- ?? Isolation transformers shall be provided when necessary to prevent shock from transformer less equipment.
- ?? Any outlet voltage and frequency other than 110 VAC, 60 Hz shall be so labeled.
- ?? Any equipment with A/N (Army-Navy) Power Connectors (Army-Navy Positive Latching) shall have different dedicated power cables to ensure that polarization of the connectors is compatible with each different individual equipment safety ground and power connections.
- ?? To minimize fire hazards, circuit breaker disconnect at the power panel shall be rated at not more than 20 amps unless equipment power requirements so dictate. Any new power strips installed on workbenches should have each outlet fused.
- ?? Workbench power panel disconnects shall be identified by labels at the power panel. Workbench outlets shall also be labeled to identify the power panel and circuit breaker that controls those outlets.
- ?? Lighting in workbench areas shall be no less than 100-foot candles.
- ?? Electrical outlets and bench wiring should be checked at least quarterly to assure proper wiring and grounding, and detect deteriorated wiring.

4.1.3.21.6 Circuit interrupters

Temporary ground fault circuit interrupters (Class A type, 5mA trip) shall be used on the ac outlets whenever hand held power tools are used on metal workbenches.

4.1.3.21.7 Power Disconnects/Kill Switches

Smoking shall not be allowed in electronic maintenance areas.
Workbench structure shall be inspected periodically to ensure that working conditions or bench configurations have not changed to introduce any hazards.
Each workbench or piece of electronic equipment shall be provided with a means of dis-connecting the power.

- ?? If power panels or circuit breakers are not located in the same room and readily accessible from each workbench, power kill switches or disconnects shall be installed.
- ?? Power kill switches or disconnects shall be located at or within reach of each workbench or piece of equipment.
- ?? These switches shall be conspicuously marked and readily accessible.

4.1.3.22 Transformer-less Commercial Equipment

Many radio and TV receivers available commercially are of the ac/dc variety. Some ac/dc radios have series tube filaments using one side of the ac line input as chassis ground. These receivers are characterized by the absence of an input power transformer. They are a deadly shock hazard, particularly aboard ship where the ac power lines are electrically above the ship's ground. In this case, 115Vac may exist between the receiver chassis and ground. Avoid procuring ac/dc equipment. When it cannot be avoided, the following safety precautions shall be taken:

?? An isolation transformer shall be installed in the ac power line between the receiver and the power source. Isolation transformers adapted to a three-wire system are preferred and may be obtained from commercial sources.

?? The equipment chassis shall be grounded by the use of a three-wire power cord. The ground wire shall be connected to the chassis and the other end of this wire shall be connected to a proper ground point. If a three-wire type isolation transformer is not available, the case of the isolation transformer and the equipment chassis shall be grounded with solid copper grounding strap(s). See figure 4.1-2

4.1.3.22.1 Equipment Grounding Installation

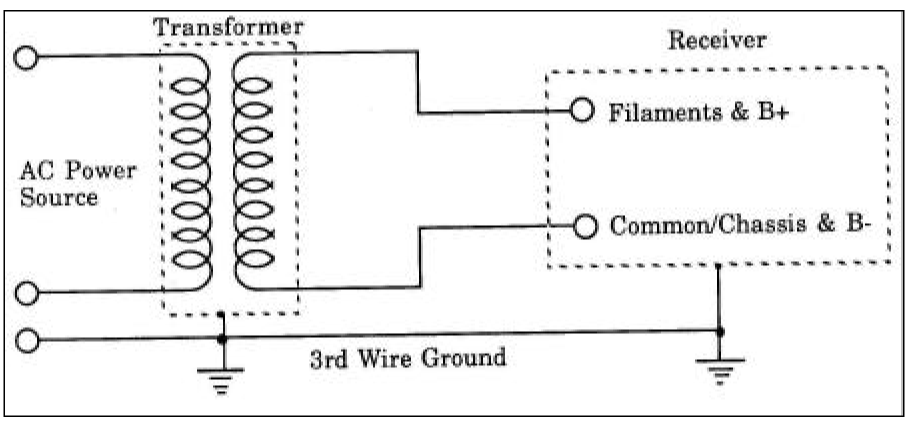


Figure 4.1-2 Equipment Grounding Installation

4.1.3.22.2 Commercial Radio/TV Receivers Safety Hazards

The equipment shall be tested for safety hazards.
Commercial Radio and TV Receivers. The use of personal morale electronic equipment aboard vessels and shore stations of the Coast Guard shall comply with the unit's safety regulations.

4.1.3. 23 Primary power Filter Shock Hazard	To reduce electromagnetic interference (EMI), it is necessary to filter the primary power lines. Unless bleeder circuitry is provided, power line filter capacitors remain charged after power has been removed, thereby creating an electrical hazard. Prior to touching these capacitors the terminals must be shorted. Additionally safety decals shall be displayed in plain view on all power line filters.

4.1.4 Rescue and Resuscitation of Electrical Shock Victim

4.1.4.1
Rescue of Electrical Shock Victims

A victim of electrical shock may present some or all of the following characteristics;

- ?? The person may be completely unconscious,
- ?? Face looks pale and deathly,
- ?? Pulse may be extremely weak or entirely absent,
- ?? Electric burns are present along with the smell of burnt flesh,
- ?? The body becomes stiff or rigid.

4.1.4.2
Rescue Quick Action

To save the life of an electric shock victim requires quick action. Records show seven out of ten victims of electric shock were revived when artificial respiration was started in less than 3 minutes after the shock. When rescuing a person who is in contact with a live wire or circuit, the first thing to do is to turn off the power in the circuit. If this cannot be done, do not touch any part of the victim with your body in getting him free. Take an insulated pole or stick (non-metallic, non-conducting material free of dirt, grease, paint and varnish) and attempt to pry the victim free of the energized circuit. A piece of dry line (rope), your (dry) clothing, or your belt could be looped over the victim's arm or leg, after which the victim could be removed safely. Only after the victim is free, is it safe to actually touch him. Otherwise, the rescuer has a very good chance of becoming another victim. Good common sense is most important in a situation such as this. Remain calm and remember, it is important to quickly remove the victim from the energized circuit while being very careful of your own safety.

4.1.4.3 Resuscitation For Electric shock

Artificial resuscitation after electric shock includes artificial respiration to establish breathing, and external heart massage to re-establish heart beat and blood circulation. Immediately after removing the victim from the electric circuit, apply mouth-to-mouth artificial respiration. If there is no pulse, immediately apply heart massage. Send for a doctor or corpsman as quickly as possible. Do not waste precious time in moving the victim to a roomier and drier location. Use common sense. If you are the only person around, do not leave the victim to find help. Try shouting while continuing to give resuscitation and heart massage.

4.1.4.4 Revival Techniques Training

The Electronics Material Officer (EMO), senior technician or supervisor shall ensure that personnel engaged in electronics work be instructed in Cardio-Pulmonary Resuscitation. Each person shall be required to demonstrate his or her proficiency in mouth-to-mouth resuscitation and in closed-chest cardiac massage including an alternate method of resuscitation. Periodic drills shall be held on these first aid techniques. Posters on resuscitation shall be procured and posted in all electrical/electronics spaces.

4.1.5 Cold Weather Safety Precautions

4.1.5.1
Cold Weather Safety Precautions

?? Careful instruction and indoctrination of all personnel is necessary to observe safety precautions peculiar to cold weather and arctic operations afloat and ashore. Precautions include:
DO wear loose clothing -- tight clothing and foot gear restrict blood circulation and invite frostbite or trench foot.

?? **DO** wear dry clothing -- outer layers should be water repellent and impervious to rain, snow, and sleet.

?? **DO** wear several layers of thin clothing, this will allow the removal of clothing layers as body heat rises.

?? **DO** work in pairs -- check each other for frostbite, since a person can become frostbitten and not realize it. Frostbitten skin becomes whitish or grayish, and the parts feel numb rather than painful.

?? **DO** wear sunglasses or goggles with tinted lenses to protect eyes from snow blindness and eyestrain.

?? **DO** be very careful when working with fuels and volatile liquids; gasoline will freeze flesh in seconds.

?? **DO** use windshields or screens whenever working on exposed equipment.

?? **DO** frequent rest, hot drinks, and food are necessary for efficiency of personnel working on exposed equipment.

?? **DON'T** overheat -- excessive sweating dampens clothing, resulting in poor insulation. Perspiration cools the body even more as it evaporates. It is better to be slightly chilly than excessively sweaty.

?? **DON'T** touch metal objects with bare hands, although seemingly dry, skin instantly freezes to very cold metal.

4.1.6 Chemical and Explosive Hazards

4.1.6.1 Overview

The work of electronic personnel brings them in contact with various chemical and explosive hazards. They may have to work with flammable solvents, toxic solvents, explosive gases, acids, bases (lye), high-vacuum implosive tubes, etc. All of these hazards are dangerous. Some are even deadly if not handled properly. All personnel shall observe proper safety practices when they are required to work with various chemical and explosive hazards. Personnel must review and use proper safety and health procedures when working with these where applicable:

4.1.6.2 Chemical Safety and Health Equipment

Equipment	Purpose
Safety Glasses/Face Shields	To protect eyes and face from acids, alkalis, solvents, flying glass, metal, and other particles.
Rubber Gloves (corrosion resistant)	To protect hands from acids and alkali spills.
Rubber Gloves (5,000 volt) with glove shells	To protect hands when handling high vacuum tubes.
Synthetic Rubber or Plastic Coated Gloves	To protect hands for jobs that require immersion in a solvent
Rubber Aprons	To protect body from acid and alkali spills.
Ventilating Equipment	To remove dangerous gases and vapors from a confined or unventilated work area. Wet cell lead acid type batteries emit hydrogen gases while charging. Hydrogen gas is extremely explosive. Adequate ventilation for rooms or spaces containing wet cell batteries must be provided and maintained in good working order.
Storage	By proper storage, protect personnel from spilling and evaporation of dangerous chemicals and gases (See para. C.3.g.(3)). Refer to the unit's regulations manual for proper storage.
Neutralizers	For neutralizing corrosive liquids that come in contact with the body.

Table 4.1-5 Chemical Safety and Health Equipment

4.1.6 Chemical and Explosive Hazards, Continued

4.1.6.3
Use of Electric Tools IVO Chemicals and Explosives

The use of portable electric tools or spark producible hand tools shall be avoided in the presence of volatile gases and other combustibles. Equipment designated as "explosion-proof" or "non-sparking" shall be used, where standard portable electric tools or ferrous hand tools may create sparking, which could result in a possible fire and/or explosion.

4.1.6.4
Handling and Disposal of PCB

PCB/PCB-contaminated transformers and capacitors installed in operating equipments and on hand as spares may continue to be used until they fail. These capacitors and transformers must be identified as containing PCBs and shall be inspected WEEKLY for signs of leakage. PCB/PCB-contaminated transformers may be flushed and refilled to reduce the amount of PCBs in the unit and allow reclassification. This process is usually done on site with the unit in operation. PCB/PCB-contaminated transformers and capacitors that have failed may NOT be reworked or rebuilt, and must be replaced. The failed unit must be disposed of in compliance with EPA regulations. Refer to Handling and Disposal of PCBs, COMDTINST M16478.2 (series) for complete procedures.

4.1.6.4.1
Accessing PCB Contaminated Parts

When accessing or surveying equipment containing PCB/PCB-contaminated parts, the PCB items must be removed from the equipment, segregated and disposed of in accordance with EPA regulations. DO NOT SHIP PCB/PCB-contaminated transformers and capacitors or equipment containing these items to either SUPCEN Brooklyn or the local DRMO.

4.1.6.4.2
Recovery Drum

Effective January 1980, The Code of Federal Regulations (CFR), Title 49, revised Section 173.3(c), authorized the use of a recovery drum ONLY for the purpose of shipping damaged, defective, or leaking packages or dangerous and hazardous chemicals to a facility for disposal or re-packing. NSN 8110-01-1010-4056 for the 85-gallon capacity, removable head recovery drum. Prospective users are cautioned to review Section 172.3(c) in full to be assured of complete compliance with statute regulations.

4.1.6.4.3
PCB Screening Kits

The DEXSIL Corporation, 295 Treadwell Street, Hamden CT. 06514, phone (203) 288-3509 manufactures easy to use PCB screening kits. The "CHLOR-N-OIL-50" will test from 0 to 50 Parts Per Million (PPM), and the "CHLOR-N-500" tests to 500 PPM. Negative test results indicate the item is PCB free. Positive test results indicate the presence of PCBs. Further testing will be required to identify the exact types and amounts of PCBs. Consult the Environmental Protection Specialist in your District Planning Office (dpl) and Handling and Disposal of Polychlorinated Biphenyls (PCBs), COMDTINST M16478.2 (series) for current information and practices.

4.1.6.4.4
Disposal of Hazardous Materials

The Hazardous Waste Management Manual, COMDTINST M16478.1 (series) requires MLC and district commanders and commanding officers to make arrangements for disposal of hazardous materials and waste.

4.1.6.5
Handling Cathode Ray Tubes

The trend toward larger cathode ray tubes has increased the danger of implosion, flying glass, and the potential injury and severe shock from high voltage. Tubes are not dangerous if handled properly. If they are handled carelessly, struck, scratched, or dropped, they can become an instrument of severe injury or death. The following precautions shall be taken for protection of personnel:

4.1.6.5.2
Care of Cathode Ray tubes

Do not expose tubes unnecessarily to damage. When the tube is needed, remove it from the packing box with caution, taking care not to strike or scratch the envelope. Insert it into the equipment socket cautiously, using only moderate pressure. Do not jar the tube. These precautions also apply when removing tubes from equipment sockets. When the tube must be set down, it is important that the face be placed on a clean soft padding. Do not stand directly in front of the tube face, for accidental implosion may cause it to be propelled forward with a velocity sufficient to cause severe injury.

4.1.6.5.1 Protective equipment/clothing

- ?? Wear face masks/shields to protect the face. Envelope fracture combined with the vacuum within the tube can result in implosion and flying glass particles. Face shields, which provide side and front protection and have clear glass lenses, which will withstand a fairly rigid impact test, are required.
- ?? Wear rubber gloves (5,000 volt) with glove shells.
- ?? Be sure that no part of the body is directly exposed to glass splinters in case of tube implosion. The coating on some tubes is poisonous if absorbed into the blood stream.
- ?? All cathode ray tubes should be handled with caution. Although most tubes in this category are harmless, it is possible that some tubes utilize phosphors in the elements. Phosphors contain a small amount of the harmful chemical beryllium. It is impossible to distinguish tubes containing beryllium from any others. Therefore, all cathode ray tubes should be considered harmful.

4.1.6.5.3 Disposal of Cathode Ray

To dispose of cathode ray tubes use any of the three following methods:

Method	Description
1	Place the CRT to be destroyed and discarded in an empty carton with its face down. Carefully break off the locating pin from its base. With a small screwdriver or probe, break off the tip of the glass vacuum seal.
2	Place the CRT in a carton face down. Then using a long, thin rod, pierce through the carton and side of the CRT.
3	Submerge the CRT in water and crush it with a blunt instrument. Fragments of glass should remain in a wet stage at all times when handled. The crushed glass must be disposed of in accordance with Commandant (G-M) policies and procedures. If any questions about the disposal of the material contact the Marine Technical and Hazardous Materials Division (G-MTH) for disposal instructions. Disposal shall be made only where the public will not be exposed to the hazard.

If any questions about the disposal of the material contact the Marine Technical and Hazardous Materials Division (G-MSO-3) for disposal instructions. Disposal shall be made only where the public will not be exposed to the hazard.

4.1.6.6 Handling Lead Acid Batteries

Use goggles, rubber gloves, and a rubber apron when handling batteries. When working around lead acid batteries, do no smoke, light a flame, generate sparks with hand tools or electric tools since the battery's hydrogen gas is highly explosive. Loosen the battery filler caps completely but do not remove them while disconnecting-connecting the battery terminals. With the filler caps loosened, should a spark accidentally be generated to ignite the hydrogen gas, the unscrewed filler cap(s) would only blow off. If a spark occurred with the caps screwed down tightly, the battery would explode, possibly causing severe injury. When disconnecting battery cables disconnect the grounded cable first. When battery cables, connect the ground cable last. This will prevent the occurrence of sparks should the wrench accidentally touch the ground frame.

WARNING

IT IS EXTREMELY DANGEROUS TO POUR WATER INTO ACID.
NEVER ADD WATER TO BATTERY ELECTROLYTE.

When it is necessary to mix the battery electrolyte solution, wear goggles, gloves and apron, and slowly pour the acid into the distilled water while stirring the solution.

The solvent approved for cleaning Coast Guard electronic or electrical equipment is TRICHLOROETHANE.
USING CARBON TETRACHLORIDE IS PROHIBITED.

WARNING

TRICHLOROETHANE--- IS A TOXIC CHEMICAL

For information on Nickel Cadmium batteries, see Chapter 5.2.6.

4.1.6.7
Using Approved Cleaning Solvent

All Coast Guard ships and shore units shall discontinue the use of Freon TF when current stock is expended. The use of Freon TF causes ozone depletion. Where practical, avoid using solvents for cleaning electrical and electronic equipments. However, if a solvent must be used for the removal of grease and pasty substances consisting of oil and carbon or dirt, the choice is Trichloroethane. This solvent which is also marketed under such names as Triclor, Methyl Cloroform, Chlorothene or Inhibisol can be procured through the supply system as:
NSN 6810-00-115-8786 6 oz aerosol CN.
NSN 6810-00-292-9625 quart CN.

4.1.6.7.1
Trichloroethane Safety Precautions

Minimum safety precautions when using cleaning solvents can be found in NSTM Chapter 300-5.2.3. In addition, the following minimum safety precautions shall be followed while solvent cleaning equipment on Coast Guard ships and shore units.

4.1.6.7.2
Using less than 2 oz of solvent

When using a small volume of the solvent, less than 2 ounces (1/4 of a cup):

- ?? Ensure that the space is equipped with ventilation, which will exhaust the solvent vapors to the outside.
- ?? If not so equipped, provide forced air exhaust ventilation to the outside using a Red Devil blower, exhaust fan or other suitable means.
- ?? Personnel involved in the cleaning operation shall wear an approved organic vapor respirator and eye protection.

4.1.6.7.3
Using in excess of 2 ounces

When using a volume of the solvent in excess of 2 ounces:

?? Provide additional forced air exhaust ventilation to the space using the ship's ventilation, Red Devil blowers, exhaust fans or other suitable means.
?? Check to assure that the solvent vapors are being exhausted outside and away from personnel and ventilation intakes.

4.1.6.7.4
Storage and Handling

Storage, handling, and use shall be as follows:

?? 1-1-1-trichloroethane is similar to carbon tetrachloride in evaporation rate and cleaning properties. It is not intended for use as a degreaser or on plastics.
?? Uninhibited, 1-1-1-trichloroethane violently attacks aluminum but this deficiency was overcome by the addition of an inhibitor.
?? 1-1-1 does leave a residue, it should be used sparingly, and only when detergent and water will not work.
?? 1-1-1 itself is nonflammable under normal use and storage conditions, but after 90 per cent evaporation, the residue contains high percentages of the flammable inhibitor.
?? This solvent is considerably less toxic then carbon tetrachloride. For repeated exposure, 350 parts of 1-1-1 to a million parts of air is generally regarded as the maximum safe concentration that can be tolerated by personnel.

WARNING
TRICHLOROETHANE--- IS A TOXIC CHEMICAL

4.1.6.7.5 Trichloroethane Safety Precautions

Although 1-1-1 Trichloroethane is less toxic than carbon tetrachloride, the solvent does present some hazards to personnel and personnel safety precautions shall be taken:

?? 1-1-1-Trichloroethane shall be stored in a well-ventilated room or compartment. The vapor is quite heavy and will settle in any low, unventilated spot, forming a potent danger source.
?? Never store it where there is any chance of its vapor collecting.
?? Where practicable, store outside.
?? Immediately dispose of any container, which shows signs of deterioration or leakage.
?? No more than one gallon of solvent should be stored in a single container.

4.1.6.7.6 Protective Equipment List

Item Description		NSN
Goggles, industrial		4240-00-764-5152
Gloves, Chemical		8415-00-823-7457
Coverall, Disposable, Tyvek	- Medium	8415-00-092-7530
	- Large	8415-00-092-7531
	- X-Large	8415-00-092-7531
Respirators	Disposable, Organic Vapor	4240-01-074-8390
	Reusable, Organic Vapor	4240-00-022-2524
	Continuous Flow, Air Line*	

Table 4.1-6 Protective Equipment List

4.1.6.8 Shipboard Air Compressors and Air Quality

WARNING

Shipboard Air Compressors Currently Installed Do Not Meet Breathing Air Quality Criteria And Are Not Authorized For Use As A Source Of Breathing Air.

4.1.6.11
Forced Air Ventilation

When using 1-1-1-trichloroethane forced air ventilation shall be used to carry away all vapors and personnel must be on the windward side of the work. For instance, inside the shop, just blowing the vapors away from the bench where the work is being performed is not sufficient. Ventilation must be such that vapors are carried directly to the outside air and not allowed to settle elsewhere in the room. Even in open air, in the absence of a strong breeze, an electric fan shall be used to blow directly on the work to carry the vapors away from the person doing the cleaning. The fan should be blowing in the same direction as the breeze. A hood or other enclosure can be made to help contain the vapors, thus making it easier for the fan to expel them from the building or ship. Hoods or enclosures must be designed in accordance with Coast Guard ventilation standards defined in the Industrial Ventilation Manual available in the Engineering Division or Safety and Health Office. The need to construct such devices should be documented and justified through an industrial hygiene health risk analysis. Support is available upon request from the District Safety and Occupational Health Office, MLC Safety & Occupational Health Office (mis), or Commandant (G-WKS).

4.1.6.12
Storage, Use and handling of Trichloroethane

The Safety Officer of the vessel or unit is responsible for the storage, use, and handling of 1-1-1. The EMO requiring 1-1-1 for cleaning purposes, is responsible to see that all persons under his jurisdiction are aware of the dangers involved. The EMO shall make certain that they observe all safety rules and have approved personnel protective equipment at their disposal. This should include synthetic rubber gloves or MESA-NIOSH approved plastic coated gloves, chemical safety glasses, and suitable ventilation of work area. Natural rubber gloves shall not be used since natural rubber is attached to some degree by this solvent. Where vapors cannot be controlled to a safe level by ventilation, personnel shall wear MESA-NIOSH approved respirators. The type of respirator required will be based on exposure concentrations and work site conditions, as define in the Industrial Hygiene Health Risk Analysis. As stated in Safety and Environmental Health Manual, COMDTINST M5100.47 (series) every Coast Guard unit is required to have a yearly inspection.

4.1.7 Chemical Treatment

4.1.7.1 Chemical Burns

Burns caused by an acid, alkali, or any other chemical should be washed immediately with large quantities of water continuously for 5-20 minutes, until the chemical is thoroughly washed away. Apply sterile compress and obtain medical attention immediately. Neutralizing of the chemical or medical treatment should not be attempted without specialized supervision.

4.1.7.2 Acute Respiratory Emergencies

Any chemical in the eye, including lime, cement, and battery fluid should be washed out immediately with quantities of water continuously for 15-20 minutes. Emergency eyewash facilities meeting the requirements of ANSI Standard Z358-1-1981 shall be provided in all areas where chemicals are used or stored. All eyewash facilities shall be located where they are easily accessible and visibly marked.

4.1.7.3 Trichloroethane vapors

A large concentration of 1-1-1 in the air may be detected by a local irritating effect upon the mucous membranes, particularly of the eyes and nose. It also has a narcotic-like effect resulting in light-headedness, lack of coordination and impaired equilibrium. High concentrations can cause coma and death; chronic exposures have resulted in liver damage. 1-1-1-Trichloroethane splashing into the eyes could cause cornea burns. The chemical (1-1-1-trichloroethane) can be absorbed through the intact skin and cause dermatitis.

4.1.7.4 Overexposure

Treatment for overexposure to 1-1-1-trichloroethane vapors requires the person be removed from the exposure area to a clean and well-ventilated area. If respiration is seriously impaired, oxygen may be required. Careful attention should be given to cardiac rhythm (heart beat) and under no circumstance should epinephrine (adrenalin) be given. Get medical attention immediately.

4.1.8 Potential hazards with Radioactive Materials

4.1.8.0.1 Overview

This section points out the potential hazard, which exists in the form of radioactive materials used in components of electronic equipment. One primary source of harmful ionizing radiation is the radioactive electron tube, which is commonly employed in modern microwave and radar equipment. It is therefore important for personnel working with such equipment to be aware of the dangers associated with radioactive electron tubes and to exercise caution when handling them.

4.1.8.1 Exposure

Exposure of the human body to ionizing radiation can be either external or internal. External exposure, originating from sources of ionizing radiation outside the body, can be dealt with by providing proper shielding, by increasing the distance from the source, or by decreasing the exposure time. Internal exposure results from radioactive substances within the body. Therefore, the problem of internal exposure resolves itself into preventing the entry of radioactive material into the body. If radioactive material is taken into the body, the effects can be quite serious and equally as dangerous as the external exposure effects connected with X-ray radiation. When a radioactive substance is taken into the body, it may tend to concentrate in certain parts of the body, or it may disperse itself throughout the body. Wherever it is located, the substance irradiates nearby cells and tissues. This irradiation process continues until the substance is excreted through normal body processes or until it decreases in radioactivity to a level, which ceases to be biologically significant. The biological damage caused by such internal emitters depends upon many factors, such as the concentration and distribution of material within the body, the sensitivity of tissues and organs, the route of material entry, the material solubility, and the route and rate of elimination from the body. The effect of ionizing radiation upon body cells and tissues is the same regardless of whether the radiation exposure is internal or external.

4.1.8.2
Intake of Radioactive Material

Biological effects in man occurring as a result of the intake of radioactive material are not as common as those occurring as a result of external exposures. Internal exposure to radiation can be quite dangerous and precautionary measures must be taken by persons who may be exposed to potential sources of internal radiation to avoid the intake of radioactive materials. The processes by which radioactive material can be taken into the body in the order of likelihood is: inhalation, ingestion, or absorption.

4.1.8.2.1
Inhalation

Airborne particles of radioactive material gain access to the body through the process of inhalation, or breathing. As air containing radioactive dust or vapor is drawn into the lungs and exhaled, some filtering takes place and the larger radioactive particles are removed from the air and deposited in the nose. Other particles may come in contact with, and be deposited in, the mucous coating of tissues lining the nasal and upper lung respiratory passages. Particles which are trapped in the upper respiratory passages may eventually be swallowed and enter the digestive system. Only a small amount of the radioactive material inhaled will reach the small air sacs of the lungs. Any of this material that is soluble will pass through the air sac membranes and enter the blood stream to cause damage elsewhere in the body. Insoluble materials will remain in the air sacs to cause continuous damage to the surrounding tissues and will likely result in the formation of tumors.

4.1.8.2.2
Ingestion

Particles of radioactive material can enter the body through the process of ingestion, in which contaminated food and drink is taken into the stomach. If the radioactive materials are capable of being dissolved in the digestive system, they will be absorbed in the same manner as food and carried to various parts of the body. These soluble materials may eventually be eliminated from the body by means of urine and excrement. Materials, which do not dissolve, will pass through the digestive system and will be ejected with the body excrement.

4.1.8.2.3 Absorption

Particles of radioactive material can enter the body through the process of absorption. Access to the body interior is mainly through open sores, skin punctures, cuts, scratches, or other surface wounds which may open to the entry of small particles. The absorption process depends upon the dissolving of the material in body fluids and entrance via these fluids into the blood stream. The material is then distributed throughout the body. Insoluble material entering surface wounds may remain beneath the skin tissues to cause damage.

4.1.8.3

Types of Ionizing Radiation

Ionizing radiation exists in two forms; electromagnetic radiation (consisting of photons), or particulate radiation (sometimes called corpuscular radiation consisting of electrons, positrons, neutrons, etc). Radioactive substances are sources of ionizing radiation. These substances undergo a disintegration process, which is accompanied by the emission of radiation. Most naturally occurring radioactive elements radiate either alpha or beta particles. In some cases, gamma rays accompany the alpha or beta particles. The specific properties of the radiations, such as the velocities of the alpha and beta particles, their penetrability and power of ionization, and the wavelengths of the gamma rays, depend on the particular radioactive element from which they originate.

Below is a list of the types of rays and particles:

4.1.8.4 Rays and Particles

Type	Description
Alpha Rays	Alpha rays (or particles) are particulate ionizing radiation consisting of helium nuclei carrying a positive charge traveling at moderately high speeds (approximately 7 percent of the speed of light). Alpha particles have a short range, dissipate their energy quickly, and have a very strong ionizing power. These particles have weak penetrating power and are easily stopped by a thin sheet of paper, such as this printed page.
Alpha particles	The alpha particle does not represent a danger to the body from an external source because of its weak penetrating power, but if inside the body it becomes extremely injurious. If alpha-emitting materials gain access to the body, the alpha particle will expend a large portion of its ionizing energy at short range and concentrate on a few nearby cells causing a high degree of cell damage. For this reason, alpha radiation is considered to be a greater hazard than beta or gamma radiation.
Beta Rays	Beta rays (or particles) are particulate ionizing radiation consisting of electrons or positrons traveling at extremely high speeds (up to 95 per-cent of the speed of light). They have strong ionizing power and moderate penetrating power. Beta particles do not ionize gases as readily as alpha particles, but they can penetrate shields 100 times as thick as that required to stop alpha particles. Metallic shields are very effective against beta particles; a sheet of aluminum 0.04 inch thick will stop them.
Beta Particles	The beta particle is dangerous to the body as either an external or internal source. Beta radiation from an external source is capable of penetrating skin tissues as much as centimeter thick, and if beta-emitting materials are present within the body, the hazard is greatly increased because all the energy will be given up directly to internal body tissues. An additional hazard results when beta radiation decelerates in the tissues, since rapid deceleration causes the production of X-ray radiation.

Continued on next page

Continued

Type	Description
Gamma Rays	Gamma rays are electromagnetic radiations, which originate in the nuclei of atoms. Gamma rays are similar to X-rays but extend into the shorter-wavelength region of the electromagnetic spectrum. X-rays and gamma rays of the same wavelength have identical properties. Gamma rays are more penetrating than either alpha or beta particles and can be detected after passing through as much as 2 inches of steel.
Gamma Radiation	Gamma radiation is emitted when an unstable nucleus rides itself of excess energy. Gamma radiation destroys tissues in much the same manner as does X-ray radiation. Since gamma radiation can penetrate tissues, it represents a hazard to the body as alpha or beta radiation from an internal emitter.

Table 4.1-8 Types of Rays and Particles

4.1.8.4 Internal Emitter

An internal emitter is a radioactive substance, which has been induced into the body. The hazards associated with internal emitters arise primarily from alpha and beta particles, because they are completely absorbed by body tissues before leaving the body.

4.1.8.4.1 Hazardous Electron Tubes

As long as a tube containing radioactive material remains intact and is not broken, the tube does not represent any great hazard to personnel. However, if the tube is broken, the radioactive material is released and is a potential hazard, because the material is then free to be taken into the body to become an internal emitter of radiation. Ensuring personal safety and protection from internal radiation is simply a matter of preventing the entry of radioactive material into the body by recognizing and respecting the inherent dangers associated with these tubes and handling them accordingly. Careless handling of radioactive tubes can lead to serious biological injury. In extreme cases, it may eventually lead to death.

4.1.8.4.2 Radioactive Tube Materials

Coast Guard electronic equipment employs many different tube types, some of which several contain as much as 5 micro-curies of radioactive materials per tube. These radioactive materials include carbon (C 4), cobalt (Co 60), cesium (Cs 37), nickel (Ni 63), and radium (Ra 226).

4.1.8.4.3 Production of tubes

Radioactive material is intentionally added in the production of tubes, to provide continuous supply of ionized particles in the gaseous atmosphere within the tube. The presence of the radioactive material assures reliable performance of such tubes at a given operating voltage throughout their useful life. Since the radioactive material is constantly undergoing a process of disintegration, the supply of ionized particles is always present within the tube, whether voltage is applied or not, whether the tube is stored as a spare, installed in an equipment, or lying in a waste container awaiting disposal.

4.1.8.4.4 Radioactive Tube Identification

Electron tubes that contain radioactive material require special marking in accordance with the requirements of Military Specification MIL-M-9590C. The fact that an electron tube may be marked with the conventional Atomic Energy Commission (AEC) warning symbol following the tube Atomic type number does not necessarily mean the tube is a serious hazard; it indicates only that the tube contains a radioactive material. When the level of activity for a radioactive isotope added to a tube exceeds a specified value, the conventional AEC symbol is supplemented by the addition of the word "CAUTION" placed above the AEC symbol. An electron tube is to be identified not only by the conventional AEC symbol but also by the word "CAUTION" placed above the symbol when the tube contains one of the following radioactive materials in excess of the level indicated: Cesium (Cs 37) or nickel (Ni 63) exceeding a level of 4.0 micro curie, or cobalt (Co 60) exceeding a level of .0 micro curie.

4.1.8.4.5 Radioactive Electron Tubes

Table 2-13 also lists the isotope data, where available, on each item. This isotope data will be used to compute safe stock levels for any given storage area. All areas containing storage of radioactive material should be monitored every thirty days or when new stocks are placed in such areas. The recognized safe permissible level is 7 /2 milliroentgens per hour at one meter. This level is based on 300 milliroentgens per 40-hour week. Where 7 /2 milliroentgens per hour is being exceeded, the stocks of items should be broken down into smaller quantities or moved to other areas in an attempt to reduce the radiation level to within the permissible level. In performing the above monitoring, a low intensity Beta-Gamma survey meter such as the AN/PDR-27 series is recommended.

4.1.8.4.6 Disposal of Radioactive Tubes

All electron tubes containing radium-226 are exempt from control per part 30 of Code of Federal Regulations, Title 10. Navy guidelines allow Nuclear Regulatory Commission exempt concentrations, quantities and items (very small quantities) to be disposed of with normal solid waste provided the radiation warning labels are either removed or completely obscured prior to disposal and no more than 10 quantities and items are disposed of in one year. The tubes cited as containing radium should be retained locally until verified that they do not contain a less hazardous, exempt radionuclide. If radium is confirmed, they should be disposed of as radioactive material.

4.1.8.4.7 Radioactive Material Labels

Labels for marking radioactive material may be obtained using standard MILSTRIP procedures from the Naval Forms and Pubs. Center, Philadelphia.

4.1.8.5 Disposal Responsibilities

The Hazardous Waste Management Manual, COMDTINST 16478.1 (series) requires MLC and district commanders, and commanding officers to make arrangements for the disposal of hazardous materials and wastes.

4.1.9 First Aid

4.1.9.1 General Precautions

Personnel should not attempt to recover broken pieces of radioactive tubes without wearing rubber or plastic gloves and using forceps. In removing broken pieces from equipment there is always the possibility of accidentally sustaining a wound, skin laceration, or puncture caused by a sharp piece of contaminated material. Report all injuries, no matter how insignificant they appear to be, to medical personnel.

4.1.9.2 Basic First Aid

In the event a minor skin wound is received, the following first aid procedure is recommended to minimize the possibility of contaminants entering the body. Stimulate free bleeding by applying pressure about the wound and massaging skin toward the wound.

- ?? If the wound is a small laceration or a skin puncture, make an incision to promote free bleeding.
- ?? Use a suction bulb to suck blood from the wound.

WARNING

Never suck the wound by mouth as this can cause ingestion of radioactive material.

- ?? Limit contamination by thoroughly washing the wound with mild, pure soap and flushing with large quantities of running water.
- ?? Do not use detergents or alkaline soaps.
- ?? When these procedures have been accomplished, notify responsible medical personnel so that the wound may be monitored to detect any remaining contamination, evaluated, and, if necessary, given further treatment.
- ?? Save the object, which caused the wound for analysis and monitoring by radiological personnel.

4.1.9.3 Radioactive tube cleanup kit

A radioactive tube cleanup kit shall be made from locally procured items and kept in the space, which contains reactive tubes. It shall consist at a minimum the following:

- ?? FRESH WATER, 6-12 oz. in an unbreakable container.
- ?? 2 sealable (ziploc type) plastic bags approx 12" by 12".
- ?? pair forceps or tweezers.
- ?? 50 or more 4" X 4" gauze pads or rag strips.
- ?? 2 pair rubber surgical gloves.
- ?? 1 roll of masking tape, 1 to 3 inches wide.
- ?? Radioactive material signs.
- ?? Rope with radioactive signs attached, plus extra signs.
- ?? Surgical masks.
- ?? 2 each 12 by 12 inch clothes.
- ?? A copy of cleanup instructions.

WARNING

Take care to avoid breathing any vapor or dust, which may be released by tube breakage.

4.1.9.4 Area Decontamination Procedures

The following procedures shall be strictly adhered to when breakage of an electron tube, which MAY CONTAIN radioactive materials, occurs:

Step	Action
1	**WARN OTHERS IN THE SPACE AND SECURE VENTILATION**.
2	Isolate, and cordon off the area with hazard signs and notify the OOD, CO or Damage Control Central when at General Quarters.
3	Do not permit contaminated material to come into contact with any part of your body. Anything that has been inside the perimeter should be considered contaminated.
4	No food or drink shall be brought into the contaminated area, or near any radioactive material.
5	Cover the broken tube with a damp cloth.
6	Tape off perimeter 6 to 8 inches away from the farthest piece of the broken tube.
7	Take four pieces of masking tape 8-10 inches long. Fold one inch of each end back on itself. Place these outside the perimeter selected in (3) above, but within easy reach.
8	Don the surgical mask.
9	Don rubber or plastic gloves, and fold a one-inch cuff in each glove. The gloves shall be worn at all times during cleanup and decontamination procedures.
10	Use forceps for the removal of large fragments of the broken radioactive material, and place these in the plastic bag.
11	Lay forceps and plastic bag inside the perimeter. Forceps should be on a plastic bag not on the deck.
12	Remove remaining items from the kit and place them outside the perimeter
13	Take one strip of tape from step (4) and lay over the smaller fragments. Using the forceps, press the tape to the deck causing the fragments to adhere to the tape. Handle the tape by the tabs formed in step (4). Use each piece of tape only once. Fold the used tape on itself so the contaminated side in and place in the plastic bag. Repeat this step until satisfied that no more fragments (glass and metal) can be removed.
14	Place the container near the perimeter.

Continued on next page

4.1.9 First Aid, Continued

4.1.9.4

Area Decontamination Procedures

Step	Action
15	Dampen gauze with water, and lay them overlapping all the way around the inside perimeter.
16	Using the gauze, wipe inward to the center and fold the gauze in half with the contaminated side in. Repeat until the gauze can no longer be folded. With another piece, repeat until all contaminated area has been cleaned. Place gauze into the container after it has been used.
17	Place forceps into the plastic bag, seal and place the bag in a container.
18	Remove one glove by grasping the cuff and pulling off inside out. Place the glove in the container. Remove the other glove by slipping the bare index finger inside and pulling the glove off inside out.
19	Place this glove and surgical mask into the container and seal it. Place a radioactive sticker on the container. Write the tube type if known of the sticker.
20	Report the radioactive cleanup portion of the Area Decontamination procedure is complete to the officer contacted in step (1).

WARNING

DO NOT REMOVE THE TAPE PERIMETER AT THIS TIME.

4.1.9.5 Decontaminating Tools

Send for a radiation monitor team. The radiation team shall monitor the area, tools and implements for radiation with an AN/PRC-27; they should emit less than 0.1 mr/hr at the surface.

- When necessary decontaminate all equipment that show over the 0.1 mr/hr with soap and water. Decontaminate tools and implements used to remove the radioactive substance, using soap and water.
- Immediately after leaving a contaminated area, all personnel who have handled or were in the area when it was contaminated shall remove and dispose of any clothing found to be contaminated. They shall thoroughly wash their person with soap and water, and rinse with clean water. This cleaning process shall continue until the radiation monitor team says the person or people's radiation level is at a safe level.

When the team has declared the area safe from contamination you may restore ventilation after the perimeter tape has been put into the container.

Place the sealed container (plastic bag) in a steel can, seal the can and apply the radioactive hazard signs and turn the contaminated material over to the supply officer for disposal. Refer to NAVSHIP Technical Manual, Chapter 9670 paragraph 9670.34 for further reference.

4.1.10 RF Radiation hazard

4.1.10.0.1 Overview

This section provides information on Radio frequency (RF) Radiation Hazards (RADHAZ). It outlines where RF RADHAZ could exist at Coast Guard units, reviews FCC's RADHAZ guidelines, outlines dangers associated with RADHAZ and provides safety procedures for personnel when working around RF transmitting equipment.

4.1.10.0.2 Applicability

This information applies to all CG civilian and military personnel and all contracted personnel who may be exposed to RF radiation.

4.1.10.0.3 Contents

This section contains the following topics:

4.1.10.0.4 References

a. Protection of DoD Personnel from Exposure to Radio frequency Radiation, DODINST 6055.11
b. Federal Communications Commission OET Bulletin 65 (Edition 97-01); Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields; Federal Communications Commission, Office of Engineering & Technology; August 1997
c. Federal Communications Commission OET Bulletin 56; Questions and Answers about Biological Effects and Potential Hazards of
d. Radio frequency Electromagnetic Fields (Fourth Edition, August 1999).
e. National Association of Broadcasters Engineering Handbook 9th Edition; editor Janet H. Elliot, National Association of Broadcasters, 1999.
f. USAFSAM-TR-85-73 Technical Document; Radio frequency Radiation Dosimetry Handbook (Fourth Edition) - Carl H. Durney, Habib Massoudi,
g. Magdy F. lskander, Electrical Engineering Department, University of Utah; (October 1986);
h. Summary of Coast Guard RADHAZ Tasks (RADHAZ Surveys, RADHAZ Follow-up visits and RASP visits); Dept. of Navy, NISE East Detachment Norfolk; 1989
i. Electronics Instruction and Maintenance Bulletin - General; Commander, Naval Sea Systems Command, NAVSEA SE000-00-EIM-100
j. Volume 1; Technical Manual Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel and other Flammable Material); Dept. of Navy, Commander Naval Sea Systems Command, NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010
k. Navy Occupational Safety and Health Program Manual, OPNAVINST 5100.23 (series)

4.1.10.1 Responsibilities, Guidelines and Definitions

4.1.10.1.1 Command Responsibilities

It shall be the command's responsibility to ensure Coast Guard personnel (including contractors) who routinely work directly with equipment or whose work environment contains equipment that emits RF levels in excess of the MPE levels within this chapter shall receive RF RADHAZ awareness training, ensuring their knowledge of the potential hazards of RF, established procedures and restrictions to control RF exposures, and their responsibility to limit their own exposure (e.g., included in welcome aboard training). This training shall be conducted before assigning personnel to such work areas. Refresher training should be given and may be incorporated into other periodic safety training programs. Commands shall ensure radiation measurements are taken and PEL boundaries are established, discussed during training, and consistently maintained.

4.1.10.1.2 MLC Responsibility

The MLC's shall help the units determine where RADHAZ exist at the unit and provide direction for creating standard PEL boundaries at all units.

4.1.10.1.3 Installing Unit

Units installing RF systems must complete the EMI/RADHAZ surveys and ensure that new systems comply with standards found in the Protection of DoD Personnel from Exposure to Radio frequency Radiation and Military Exempt Lasers, DODINST 6055.11 and Navy Occupational Safety and Health Program Manual, OPNAVINST 5100.23 (series).

4.1.10.1.3 FCC Guidelines

The FCC has published guidelines to be used for evaluating human exposure to RF emissions. These guidelines include limits for Maximum Permissible Exposure (MPE) in terms of electric and magnetic field strengths and power density for equipment operating at frequencies between 300 kHz and 100 GHz. The MPE limits are based upon recommendations made by the National Council on Radiation Protection and Measurements (NCRP), and limits developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI). The FCC guidelines have been developed based upon data that shows the human body absorbs RF energy at some frequencies more efficiently than at others.

The guidelines incorporate two separate exposure limits based upon the situation and the knowledge of the personnel exposed. The first is the Occupational/Controlled Exposure limit and is used when the person is:

?? Exposed as a consequence of their employment,
?? Made fully aware of the potential for exposure and
?? Able to exercise control over their exposure.

This category applies to all CG personnel who work, or might work, near RF broadcast equipment. The second exposure limit is the General Population/Uncontrolled Exposure limit. This limit is used when the general public might be exposed or when personnel exposed as a consequence of their employment might not be aware of the potential for exposure, or cannot exercise control over the exposure. The FCC states that awareness of the potential for RF exposure can be provided through specific training, warning signs and labels posted prominently near the area or risk, and instructions on the risk of exposure and methods to minimize the risk.

4.1.10.1 Responsibilities, Guidelines and Definitions, Continued

4.1.10.4.1 ATU	Antenna Tuning Unit
4.1.10.4.2 Averaging Time	The time period over which exposure is averaged for purposes of determining compliance with RF exposure limits.
4.1.10.4.3 E-Field	A field vector, which represents the forces between electrical charges.
4.1.10.4.4 Exposure	Exposure occurs when a person is subjected to electric, magnetic or electromagnetic fields other than ones that occur naturally.
4.1.10.4.5 Far-Field Region	The region far enough from an antenna that the radiated power per unit area decreases with the square of the distance. In the far-field region, the field has a predominately plane-wave character: i.e., uniform distributions of electric and magnetic fields in planes transverse to the direction of propagation.
4.1.10.4.6 FCC	Federal Communications Commission.
4.1.10.4.7 General Population/ Uncontrolled Exposure	Applies to human exposure to RF fields when the general public may be exposed or when personnel exposed because of their employment may not be aware of exposure or cannot exercise control over the exposure.
4.1.10.4.8 HERF	Hazards of Electromagnetic Radiation to Fuels.
4.1.10.4.9 HERO	Hazards of Electromagnetic Radiation to Ordnance
4.1.10.4.10 Hertz (HZ)	The unit for expressing frequency. One hertz equals one cycle per second.

4.1.10.4.11 HF	High Frequency**.** Part of the radio frequency band in the range of approximately 3 MHz to 30 MHz. Many ship-to-shore communication systems use the HF band.
4.1.10.4.12 H-Field	A field vector that is equal to the magnetic flux density divided by the permeability of the medium (usually air).
4.1.10.4.13 Human Resonance Range	The frequency region where absorption of RF energy in the body as a whole is enhanced.
4.1.10.4.14 LF	Part of the radio frequency band in the range of approximately 30 kHz to 300 kHz. The Loran Broadcast frequency (100 kHz) falls within this band.
4.1.10.4.15 Magnetic-Flux Density	The maximum electric field strength, magnetic field strength, or power densities associated with these fields to which a person may be exposed without harmful effect and with an acceptable safety factor.
4.1.10.4.16 MPE	A vector-force field used to describe the force on a moving charged particle, which is oriented perpendicular to the velocity of the particle.
4.1.10.4.17 MF	Part of the radio frequency band in the range of approximately 300 kHz to 3 MHz. The DGPS Broadcast frequencies (285.5 kHz to 325 kHz) fall within this band.

4.1.10.4.18 Near-Field Region	A region near to an antenna in which the electric and magnetic fields vary considerably from point to point and do not exhibit a plane-wave relationship. Generally the near field extends to a distance of one-half wavelength from the antenna.
4.1.10.4.19 Occupational / Controlled Exposure	Applies to human exposure to RF fields when the person is exposed because of their employment, they have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure limit also applies where the exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits. As long as the exposed person has been made fully aware of the potential for exposure and can exercise control over their exposure by leaving the area or by some other appropriate means.
4.1.10.4.20 Partial Body Exposure	Partial-body exposure results when RF fields are substantially non-uniform over the body. Fields that are non-uniform over volumes comparable to the human body may occur due to highly directional sources, standing waves, re-radiating sources or in the near-field.
4.1.10.4.21 PEL	Permissible Exposure Limits
4.1.10.4.22 Re-Radiated Field	RF radiation resulting from currents induced in a secondary, predominantly conducting object by RF waves incident on that object from one or more primary radiating antennas.
4.1.10.4.23 Radio frequency spectrum	The RF spectrum is defined in terms of frequency extending from 0 to 3000 GHz. For purposes of exposure guidelines, the frequency range of interest is 300 kHz to 100 GHz.

4.1.10.4.24 **RF "Hot Spot"**	A highly localized area or relatively more intense RF radiation that manifests itself in two principal ways: The presence of intense electric or magnetic fields immediately adjacent to conductive objects that are immersed in lower intensity ambient fields (re-radiation). Localized areas, not necessarily adjacent to conductive objects, in which there exists a concentration of RF fields caused by reflections and/or narrow beams produced by high-gain radiating antennas or other highly directional sources.
4.1.10.4.25 **Power Density**	A measurement of the RF radiation's power per area, normal to the direction of propagation. For plane waves, power density, electric field strength (E) and magnetic field strength (H) are related by the impedance of free space (i.e., 377 ohms).
4.1.10.4.26 **SHF**	Super High Frequency. Part of the radio frequency band in the range of approximately 3 GHz to 30 GHz. S-Band & X-Band radar systems operate within this frequency band. Short-term exposure: Exposure for durations less than the corresponding averaging time.
4.1.10.4.27 **UHF**	Ultra High Frequency. Part of the radio frequency band in the range of approximately 300 MHz to 3 GHz. Used for ship-to-aircraft communications.
4.1.10.4.28 **VHF**	Very High Frequency. Part of the radio frequency band in the range of approximately 30 MHz to 300 MHz. Used for ship-to-ship communications.

4.1.10.2 Thermal and Non-Thermal Effects

4.1.10.2.1 Thermal Effects

RF radiation can be harmful due to the ability of RF energy to heat biological (e.g., human) tissue rapidly; similar to how a microwave oven cooks food. Tissue damage can result primarily because of the body's inability to cope with or dissipate the excessive heat. The extent of heating depends on several factors including:

- RF frequency,
- Duration of exposure,
- Environmental conditions and
- Efficacy of heat dissipation.

Biological effects that result from heating of tissue by RF energy are called "thermal" effects. The eyes and the testes are particularly susceptible to these thermal effects because of the relative lack of available blood flow to dissipate the excessive heat load.

4.1.10.2.2 Non-Thermal Effects

Experimental evidence indicates additional biological effects might occur after exposure of tissue to lower levels of RF radiation. It is possible that these "non-thermal" effects could be harmful, such as changes in the immune system, neurological effects and behavioral effects in humans exposed to RF radiation. However, because of contradictory experimental results, nothing has been proven.

4.1.10.2.3 Human Resonance Range

The electromagnetic frequency of RF radiation is as important as the radiation levels in determining the relative hazard. Absorption of RF energy by humans will occur at a maximum rate when the frequency is between 30 and 300 MHz (VHF Band). Because of this "resonance" phenomenon, RF safety standards take this frequency dependence into account. However, extended exposures for periods longer than the MPE, even at low power levels and frequencies outside this range, could be dangerous.

4.1.10.2.4 Other Hazards

Other hazards exist within the broadcast antenna's near-field in addition to the RF energy's thermal and non-thermal effects on the human body. Although these hazards will become more noticeable as you move closer to the antenna, they should be assumed to exist anywhere the MPE limit is exceeded. Extreme caution should be used whenever working around energized broadcast equipment.

4.1.10.3 RF Burns and Electrical Shock hazards

4.1.10.3.1 RF Burns	RF energy can induce a current on nearby improperly grounded, or ungrounded, conductors (e.g., metal poles, fences, wires or wet objects). If one of these conductors with an induced current present is touched, a discharge path is created and burns might occur on the skin.
4.1.10.3.2 Electrical Shock Hazards	The voltages present at the transmitter, antenna feed cables and the antenna can be large enough that a discharge path can be created when the distance between two conductors (e.g., the antenna and someone's reaching hand) exceeds the breakdown voltage of the dielectric (air), ionization occurs and a very low-impedance path between the conductors develops. This will result in an electrical shock and potential burns to the skin.
4.1.10.3.3 Startle Effect	A danger associated with both RF Burns and Electric Shock is known as the "Startle Effect". When startled from a shock or burn, a person's reflexive reaction can actually cause greater injury than the initial shock or burn. For example, if located on a ladder when shocked, the Startle Effect can cause a person to fall off the ladder, resulting in a serious injury. The most effective way to prevent injury from the Startle Effect is to be aware of the potential for either RF Burns or Electric Shock when working around energized equipment. Awareness will help to limit the reflexive reaction and the injuries that might result.

4.1.10.4 HERF and HERO

4.1.10.4.1 Overview

The operation of electronic transmitters used for radio and radar may induce RF voltages in the standing rigging, parts of the superstructure, other antennas, cables, etc. The presence of RF voltages on such objects may arc between closely spaced conductive metal objects or cause sparks when contact is made or broken by personnel. If the RF voltage contains sufficient energy, the heat of the spark (or arc) may be sufficient to ignite fuel vapors and other explosive mixtures.

4.1.10.4.2 HERF

HERF (Hazards of Electromagnetic Radiation to Fuels) requirements apply only to storing aviation gasoline or automotive gasoline. Marine diesel fuel and JP-5 jet fuel are not considered to have a HERF problem and require no special electromagnetic safety precautions during fueling.

Adequate precautionary measures must be taken to nullify the hazards of explosions or fires in areas where gasoline vapors are present and during fueling of aircraft or handling of ammunition, volatile liquids or gasses. Units should have a HERF instruction to limit the exposure of fuels to RF energy.

Ordnance systems are also potentially affected by RF energy. RF energy may enter a weapon as a wave radiated through a hole or crack in the weapon's skin. RF energy may also be conducted into the weapon by the firing leads or other wires that penetrate the weapon enclosure. The most likely effects are dudding and reduction of reliability, but there is a low probability of detonation.

4.1.10.4.3 HERO

The most susceptible periods of RF exposure to ordnance is during loading and unloading. If applicable, units should have a HERO (Hazards of Electromagnetic Radiation to Ordnance) plan to limit the exposure of ordnance to RF energy.

4.1.10.4 HERF and HERO, Continued

4.1.10.4.4 HERF/ HERO Precautions

During the handling of ammunition, volatile liquids or gases the following minimum precautions shall be observed:

?? Alert personnel involved with the evolution as to the hazards involved.
?? Use an insulated steering hook for guidance of boom or hook cables.
?? Insulate the loading hook from crane or boom cables with manila rope or RF insulators when feasible.
?? Ensure proper ventilation.
?? Minimize the use/presence of metal objects/tools in the area.
?? Secure all transmitting antennas located within the quadrant of the ship in which the evolution is being conducted.
?? If unable to secure transmissions either relocate operations to a different area or, if possible, reduce the transmitters power during the evolution.

4.1.10.4.5 Additional Precautions

Additional precautions to follow when fueling include:

?? **DON'T** energize any radar or communications transmitter on the aircraft or motor vehicle being fueled or on adjacent aircraft or vehicles.
?? **DON'T** make or break any electrical, static ground wire, tie down connection or any other metallic connection to the aircraft or vehicle while it is being fueled. Make the connection before fueling commences and break them afterwards.

4.1.10.5 Maximum Permissible Exposure

4.1.10.5.1 Overview

The MPE limits (also known as the Permissible Exposure Limits (PEL)) have been set to allow the body enough time to dissipate or "cool" before returning to the RF field to ensure that no injury occurs. Tables 4.1-9 & 4.1-10 show both the Occupational & General Population MPE's for all frequencies.

4.1.10.5.2 Occupational Population MPE

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time (minutes) $\lvert E\rvert^2$, $\lvert H\rvert^2$ or S
0.3-1.34	614	1.63	(100)	30
1.34-30	824/f	2.19/f	($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

Table 4.1-9 Occupational Population MPE

4.1.10.5.3 General Population MPE

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time (minutes) $\lvert E\rvert^2$, $\lvert H\rvert^2$ or S
0.3-3.0	614	1.63	(100)	6
3.0-30	1842/f	4.89/f	($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

Table 4.1-10 General Population MPE (f = frequency in MHz)

4.1.10.5.4 Power Density Equation

The relationship between the E-field strength, H-field strength and Power Density is expressed in the following equation:

$$S = \frac{E^2}{3770} = 37.7\,H^2 \qquad (1)$$

Where: S= power density (mW/cm2)
E = electric field strength (V/m)
H = magnetic field strength (A/m)

4.1.10.5.5 Occupational Averaging Time

The averaging time for the occupational/controlled exposures is six minutes. This means, that for any six-minute period, a person cannot be exposed to an electric field, magnetic field or power density higher than the MPE in Table 4.1-9. A person can be exposed to radiation levels higher than the MPE for shorter periods of time as long as the average level of exposure doesn't exceed the MPE for any six-minute period.

4.1.10.5.6 Examples

Here are three examples to help illustrate this principle:

1. A worker can safely be exposed to twice the applicable power density limit for three minutes as long as they were not exposed at all for the three minutes preceding or following the exposure.
2. A worker can safely be exposed to three-times the electrical field strength limit for two minutes as long as they were not exposed at all for the four minutes preceding or subsequent to the exposure.
3. A worker exposed to exactly the power density limit would be able to remain in the field for any six-minute period, (i.e., indefinitely).

In all three cases, whenever the six-minute clock starts (before, at the start of, or during the exposure) the average total exposure never exceeds the MPE.

4.1.10.5.7 General Public Averaging Time

Any area that the general public might have access to must not have an MPE higher than the limits in Table-4.1-10. These "general public" limits also apply to any Coast Guard personnel who may be unaware that a RADHAZ exists (e.g., not normally assigned to the area; passage ways or transit areas). Like the occupational limits, whenever the thirty minute clock starts (before, at the start of, or during the exposure) the average total exposure during those 30 minutes can never exceed the MPE. Since it is impossible to control the amount of time that a member of the general public might be exposed to the RF radiation, it must be assumed that they will be in the field for the full length of the averaging time

4.1.10.6 PEL Boundaries

4.1.10.6.1 PEL Overview

A PEL boundary is established to delineate the RADHAZ exclusion zones, areas where the potential RF radiation exceeds the general public/uncontrolled exposure MPE limit. This boundary is also used to inform technicians when they must be concerned about their averaging time. The PEL boundary can also be used to restrict access to RADHAZ exclusion zone, ensuring that no member of the general public enters into an area exceeding the MPE limit. Whatever its form, a PEL boundary must be properly marked, warning personnel of the RADHAZ.

4.1.10.6.2 Determining PEL Boundaries

The following equation (2) predicts the radius of the MPE limit from an antenna: (2)

$$R = \sqrt{\frac{0.41ERP}{?S}}$$

Where: R = distance to the center of radiation of the antenna
ERP = antenna's effective radiated power (in appropriate units, e.g. mW)
S= power density (in appropriate units, e.g. mW/cm2 - from Table 4.1-6)

4.1.10.6.3 Using Equation

When using this equation care must be taken to use the correct units for all variables. Since the MPE table lists S in mW/cm2, ERP should be in mW and it will result in a distance from the antenna "R" in cm.

Equation (2) should be used to determine an approximate PEL boundary around an antenna. Then, starting at this distance, use a meter capable of measuring the electrical, magnetic and power density for the RF frequencies present (Holaday and Narda are two companies that manufacture RF meters) to determine the actual extent of the MPE Limit. This data can then be used to set the actual PEL boundary.

The meter should also be used to determine the PEL boundary around all other sources of radiation (e.g., transmitters, transmission lines, ATU's, etc.) while they are operating at maximum power.

NOTE:

The minimum distance for the PEL boundary in all directions shall be the furthest distance from the antenna, in any direction, that exceeds the MPE limits.

4.1.10.6.4 Determining PEL Boundaries, Shore Units

Whenever practical, PEL boundaries at shore units should restrict access to the area. Restricting access can be as simple as locking the door to a space or access to a roof that has areas above the MPE limits, allowing only trained technicians into the space. For most shore based broadcast sites (e.g., DGPS broadcast sites, VTS Radar sites and COMMSTA's) installing a PEL fence is the best way to restrict access to areas above the general public's MPE limits. A PEL fence, with a lockable gate, installed outside these limits, not only will keep people outside of the RADHAZ area but it will also keep unauthorized people away from the equipment.

The responsible MLC, SMEF and CEU shall determine the size, location and material for the PEL fence. The fence must be properly grounded or made of non-conducting material to limit undesired effects on the broadcast signal and reduce potential for RF burns and electric shock.

At a minimum, each face of the PEL fence shall have a Type 1 RADHAZ sign posted on it and a Type 2 RADHAZ sign posted on each gate or entry way into the RADHAZ exclusion zone. Other RADHAZ signs should be posted as needed (see "RF Warning Signs" section below).

There may be situations where RF levels may exceed the MPE limits for the general public in remote areas that could conceivably be accessible but are not likely to be visited by the public. In such cases, common sense should dictate how compliance is to be achieved. If the area is properly marked with warning signs, a PEL fence may not be necessary.

4.1.10.6.5 Determining PEL Boundaries, Afloat Units

When determining PEL boundaries on ships, measurements should also be taken above and below the level of the antenna to determine a three dimensional PEL boundary.

The primary method for marking a PEL boundary on ships is to paint a 4 inch wide red line or circle on the deck at the extent of the MPE limit. If an antenna is used for more than one frequency range, differing power levels, or the PEL boundaries overlap, the RADHAZ exclusion zone with the largest area must be marked.

RADHAZ signs should also be used to mark the PEL boundary to help inform personnel of the RADHAZ present. Review the "RF Warning Sign" section below to determine the type sign(s) needed and their appropriate placement.

Depending upon the extent and level of the radiation, additional methods to establish a PEL boundary may be used. These additional methods may include temporarily restricting access to a section of the ship when the equipment is operating, limiting the power used unless the MPE area is clear of personnel or only operating within a certain frequency range unless the MPE area is clear of personnel. Again, appropriate use of RADHAZ signs will ensure these procedures will be followed.

The cognizant MLC shall assist the ship's crew in determining and establishing the PEL boundaries. As each unit has differing layouts and equipment, the PEL for each ship, even within the same class will probably vary. Therefore, each ship should promulgate an individual Radiation Hazard Policy to cover the procedures on that ship.

RADHAZ surveys have been conducted on several classes of cutters and shore units. Table 4.1-11 outlines the distance of an average PEL boundary for transmitting antennas on various classes of ship.

4.1.10.6.6 Typical PEL's for Ship Antennas

Platform	Equipment	Watts	Frequency	Distance
399' WAGB	CCEM-229F	100 W	MF/HF	15 feet
	Long Wire	1000 W	HF	6 feet
	CDFL-MLA-324	100 W	MF/HF	12 feet
	CDFL-MLA-115	1000 W	MF/HF	10 feet
378' WHEC	CCEM-390-2	100 W	HF	4 feet
	CDFL-MLA-324	1000 W	HF	12 feet
	CDFL-MLA-115	1000 W	HF	10 feet
	5/16" Wire Rope	1000 W	HF	13 feet
270' WMEC	CCEM-229F	1000 W	MF/HF	10 feet
	CDFL-MLA-324	1000 W	HF	10 feet
	CDFL-MLA-115	1000 W	HF	12 feet
210' WMEC	CCEM-229A	100 W	MF/HF	6 feet
	CCEM-390-2	100 W	MF/HF	6 feet
	CDFL-MLA-115	1000 W	MF/HF	12 feet
	CCEM-229	1000 W	HF	10 feet
180' WLB	CCEM-390-2	100 W	HF	6 feet
	CCEM-229F	1000 W	HF	12 feet
110' WPB	CCEM-390-2	100 W	HF	6 feet
82' WPB	CCEM-390-2	100 W	HF	4 feet

Table 4.1-11 Typical PEL's for Ship's Antennas

4.1.10.6.7 Determining PEL Boundaries for Antennas

Similar to the procedures for determining the PEL boundary using equation (2) and the distances in Table 4.1-11 should be used to obtain an approximate distance. A RADHAZ meter should then be used to measure the exact levels of RF energy and the data used to set the actual PEL boundary.

4.1.10.6.8 Radar PEL's

Most radars operate in the SHF band with output powers as high as 30 kW and antennas that have very high gains (+25 dB). However, due to the narrow bandwidth and pulse nature of radar operations, the RADHAZ from radar antennas is relatively small. A good rule of thumb when an antenna is rotating is: If you are outside the antenna's rotation, you are outside the PEL. The PELs in Table 4.1-8 and 4.1-9, which are measured from the antenna's radiating face, have been determined for standard CG radars.

4.1.10.6.8 Radar PEL's, Continued

Due to their location on a ship's mast, the standard RADHAZ procedures for most radars should be to secure their operation whenever personnel are going aloft. A PEL boundary shall be established at the distances in Tables 4.1-12 & 4.1-13 only if personnel could be within the area during normal radar operations.

4.1.10.6.9 Typical PEL's for CG Radars

Radar	Max Power	Antenna Size	Non-Rotating PEL	Rotating PEL
SPS-69	4 kW	3.9 Feet	3.6 Feet	N/A
Bridge master	30 kW	6 Feet	35 Feet	N/A
SPS-73	30 kW	12 Feet	20 Feet	10 Feet
VTS Furuno	25 kW	10 Feet	25 Feet	10 Feet

Table 4.1-12 Typical PEL's for CG Radars

4.1.10.6.10 Typical PEL's for Navy Supported Radars

Radar	Mode	Non-Rotating PEL	Rotating PEL
MK-92 CAS	CWI Search Track	320 Feet 160 Feet 120 Feet	N/A N/A N/A
AN/SPS-40	Search	60 Feet	N/A
AN/WSC-3	SATCOM	4 Feet	N/A
CIWS	Track Search	90 Feet 60 Feet	N/A N/A

Table 4.1-13 Typical PEL's for navy Supported Radars

4.1.10.6.11 Loran PEL's

Loran Broadcast equipment operates in the LF band with some transmitters having a peak power of 1,400 kW. Although no PELs are required for any Loran equipment because of the frequencies used, the potential for electrical shock hazards at these sites is extremely high.

4.1.10.6.12 DGPS PEL's

DGPS Broadcast sites use several different antenna types broadcasting an MF frequency from 250 to 2,500 Watts. The DGPS SMEF has determined that the standard PEL at all DGPS broadcast sites is 25 feet from the broadcast antenna.

4.1.10.6.13 COMMSTA PEL's

Generic RADHAZ control measures cannot be established for Communication Stations due to the variances in antenna types, environmental conditions and surrounding structures. Each COMSTA shall conduct its own RADHAZ survey and set up appropriate PEL boundaries.

4.1.10.7 Controlling Exposure to RF Fields

4.1.10.7.1 Occupational Exposure

Personnel who routinely work directly with equipment that emits RF radiation shall follow the occupational/controlled MPE limits. For their safety, procedures shall be instituted for working in the vicinity of RF sources that will prevent exposures in excess of these limits.

4.1.10.7.2 Uncontrolled Exposure

For higher powers and frequencies it is apparent that the MPE time limits are very restrictive and could prevent any extensive work from being accomplished when the equipment is energized. PMS procedures must be adapted to meet these requirements. An example procedure would be restricting the time an individual could be near an RF source or requiring that work on or near such sources be performed while the transmitter is off or while power is appropriately reduced.

All other personnel shall follow the general public/uncontrolled MPE limits. Restricting access to all areas above these limits is the most effective way to limit exposure, but when this is impractical, ensuring appropriate PEL boundaries have been established, with warning signs, should ensure personnel are aware of the RADHAZ.

4.1.10.8 RF Warning Signs

In all cases training upon initial assignment to the unit and periodical refresher training should be given to all personnel to ensure they are aware of the potential RADHAZ, established procedures and restrictions.

4.1.10.8.1 Overview

This section contains descriptions of the currently approved RADHAZ warning signs and their intended use/placement for personnel protection. Access to PEL boundaries may include entry through scuttles or hatchways from inside a ship's superstructure as well as by ladders installed topside. All methods to access RADHAZ exclusion areas are to be inspected and the proper RADHAZ signs posted.

Locations for posting signs should be chosen carefully so that they mark, as closely as possible, the extent of a potential hazard and are also readily visible. Excessive numbers of signs tend to reduce their effectiveness and therefore indiscriminate use should be avoided. It may be necessary to post more than one type of sign in areas where multiple hazards exist.

Any metallic items located within the PEL boundary or in the near-field of the antenna can provide an RF burn hazard. Items known to have caused burns to personnel shall require a Type 3 warning sign (unless replaced with a non-metallic substitute). Instrumented testing for RF burn hazards is not required.

4.1.10.8.2
Sign Specifications

RADHAZ warning sign specifications are:

?? Base material 0.004" thick outdoor white vinyl with permanent acrylic adhesive backing.
?? Screen printed labels with ultra violet inks for maximum durability
?? Bleeds are screened as requested by artwork.
?? Black ink for lettering.
?? Red and yellow checked triangle.
?? 5" square for normal shipboard use.
?? 12" square for COMMSTA's, DGPS Broadcast Sites; shore installations and flight deck use.

NOTE:

The FEDLOG Item Name for all RF warning signs is: Identification Marker.

4.1.10.8 RF Warning Signs, Continued

4.1.10.8.3
Type 1 RADHAZ Sign

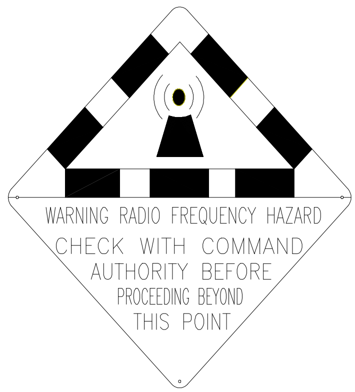
TYPE 1

The type 1 sign advises personnel not to linger in the area surrounding RF antennas where the MPE can be exceeded. Although there is no danger from exposure to RF radiation for short periods, personnel shall not remain within the PEL boundary longer than the time limit within the MPE tables. When required, install type 1 sign(s) at eye level (or where they can easily be seen) outside the PEL boundary. When applicable, post a sign at each end of the boundary

4.1.10.8.3.1
Type 1 RADHAZ Sign Ordering Information

Type 1, 5" Sign	Type 1, 12" Sign
Form # 101/5	Form # 101/12
Stock Number - 7690-01-377-5893	Stock Number - 7960-01-377-5894

4.1.10.8.4
Type 2 RADHAZ Sign



TYPE 2

The type 2 sign excludes personnel from proceeding past a designated point unless in compliance with established RADHAZ avoidance procedures. These procedures should be promulgated by unit instruction. Where applicable, install type 2 signs at eye level on doors or between the handrails of inclined ladders. When type 2 signs are used as temporary barriers they shall be waist level on a non-metallic rope, requiring that personnel approaching the area take positive action to pass.

Type 2 signs shall not be used to limit access to an area that is not subject to RADHAZ, nor inside a RADHAZ area where personnel are already exposed to RADHAZ before the sign can be viewed.

4.1.10.8.4.1
Type 2 RADHAZ Sign Ordering Information

Type 2, 5" Sign
Form # 102/5
Stock Number - 7690-01-377-5895

Type 2, 12" Sign
Form # 102/12
Stock Number - 7960-01-377-5082

4.1.10.8.5

Type 3 RADHAZ Sign

TYPE 3

Type 3 sign advises personnel not to touch, or to use special handling procedures when touching, metallic objects which can cause RF burns. This object has been proven as an RF burn source when illuminated by energy from a nearby RF transmitting antenna. Although the hazard may exist only at certain frequencies and power levels, personnel should regard the object as a hazard unless the transmitter is secured. Type 3 signs should be installed on the RF burn source or in the immediate vicinity where easily seen. When used on cargo handling, running rigging, type 3 signs are to be mounted on the hook insulator and personnel are to be warned not to touch the wire/rigging above the insulator. More than one type 3 sign should be installed on larger burn sources that can be approached from more than one direction.

NOTE:

Whenever possible the RF Burn source should be replaced with a non-metallic substitute or relocated/reoriented to eliminate the hazard before resorting to a type 3 sign for personnel protection.

Continued on next page

4.1.10.8.5 Type 3 RADHAZ Sign, Continued

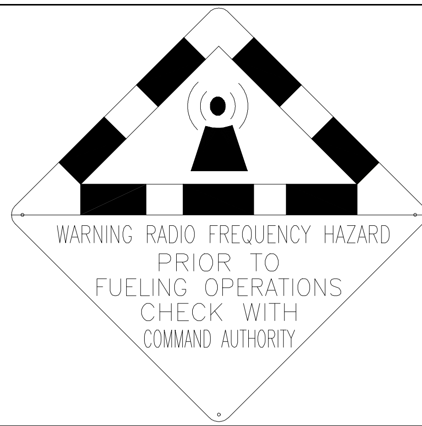
Effective RF burn hazard measurement standards have not been defined and suitable test devices and safe measurement procedures are currently unavailable. Therefore, placement of RF burn hazard signs will be based upon actual personnel burns experienced by unit personnel or by personnel of other similar units.

4.1.10.8.5.1 Type 3 RADHAZ Sign ordering Information

Type 3, 5" Sign	Type 3, 12" Sign
Form # 103/5	Form # 103/12
Stock Number - 7690-01-377-5896	NSN - 7960-01-377-5098

4.1.10.8 RF Warning Signs, Continued

4.1.10.8.6
Type 4 RADHAZ Sign



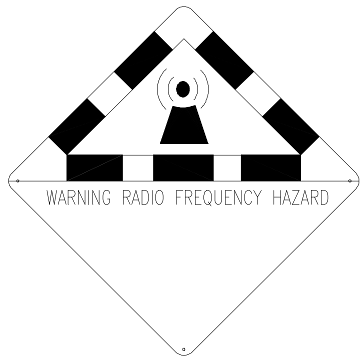
The type 4 sign advises of the hazards of electromagnetic radiation to fuels (HERF). These requirements apply only to storing aviation gasoline or automotive gasoline. Marine diesel fuel and JP-5 jet fuel are not considered to have a HERF problem and require no special electromagnetic safety precautions during fueling. Install type 4 warning signs above gasoline fueling stations. These signs should be used to ensure personnel follow the command's HERF policies.

4.1.10.8.6.1
Type 4 RADHAZ Sign Ordering Information

Type 4, 5" Sign
Form # 104/5
Stock Number - 7690-01-377-5899

Type 4, 12" Sign
Form # 104/12
Stock Number - 7960-01-377-5900

4.1.10.8.7
Type 5 RADHAZ Sign



TYPE 5

Type 5 sign has a blank area in which special precautions, necessary for safe operations, can be typed. Its purpose is to advise personnel of procedures to follow when other RADHAZ warning signs are not appropriate to ensure personnel safety. Examples of data appropriate to a type 5 sign include:

?? Inform OOD before placing system in radiate mode.
?? In manual mode, do not depress below horizon between ____ and ____ degrees relative.
?? Ensure temporary exclusion barriers are in place before radiating.
?? Do not stop antenna between ____ and ____ degrees when radiating.

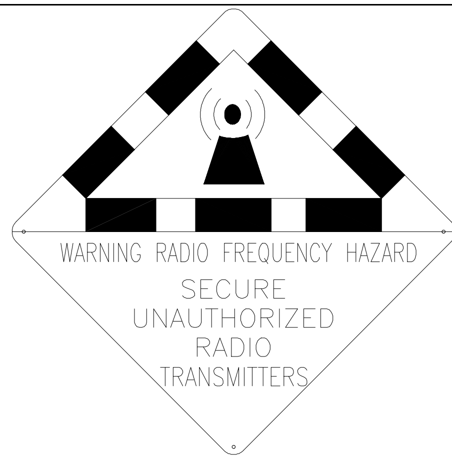
A type 5 sign normally is installed below decks in a system equipment room. This sign should be installed where easily viewed by system operators while positioned for normal operation, in the vicinity of the applicable controls (e.g., radiate switch, antenna control switch, etc). When mounted on system cabinets or control panels, RADHAZ signs shall not cover or obscure switch labels, meters, indicators or nameplates.

4.1.10.8.7.1
Type 5 RADHAZ Sign Ordering Information

Type 5, 5" Sign
Form # 105/5
Stock Number - 7690-01-377-5374

Type 5, 12" Sign
Form # 105/12
Stock Number - 7960-01-377-5375

4.1.10.8.8
Type 6 RADHAZ Sign



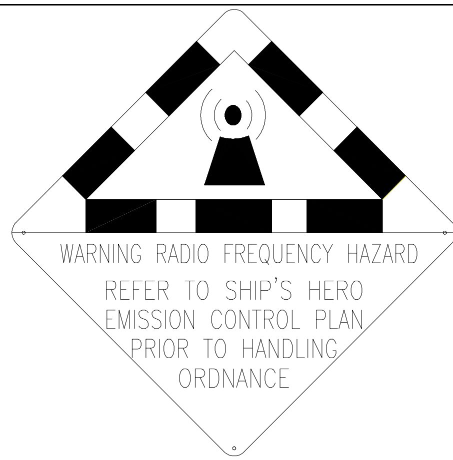
The type 6 RADHAZ warning sign advises personnel not to operate transmitters within designated areas. Personnel not familiar with the Command's requirements for transmitter operation are to check with the OOD prior to operating transmitters.

4.1.10.8.8.1
Type 6 RADHAZ Sign Ordering Information

Type 6, 5" Sign
Form # 106/5
Stock Number - 7690-01-377-5444

Type 6, 12" Sign
Form # 106/12
Stock Number - 7960-01-377-5447

4.1.10.8.9
Type 7 RADHAZ Sign



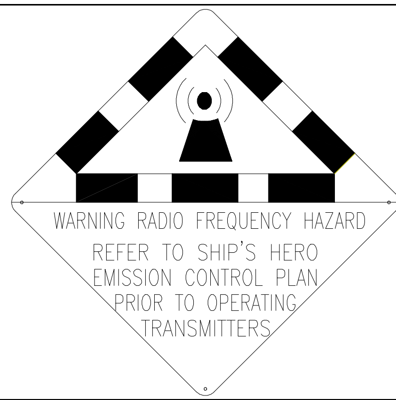
The type 7 sign advises of the hazards of electromagnetic radiation to ordnance (HERO). Install type 7 warning signs in areas where ordnance is loaded and near the unit's magazines. These signs should be used to ensure personnel follow the command's HERO policies.

4.1.10.8.9
Type 7 RADHAZ Sign Ordering Information

Type 7, 5" Sign
Form # 107/5
Stock Number - 7690-01-377-5901

4.1.10.8 RF Warning Signs, Continued

4.1.10.8.10 Type 8 RADHAZ Sign



The type 8 RADHAZ warning sign advises operators to refer to the unit's HERO Emission Control Plan prior to operating the transmitter. It is important that HERO procedures for restricting RF emissions be thoroughly understood and followed.

4.1.10.8.10.1 Type 8 RADHAZ Sign Ordering Information

Type 8, 5" Sign
Form # 108/5
Stock Number - 7690-01-377-

4.2 Professional Development

4.2.0.1 Overview

This section provides policy and guidance on training, education and development of personnel concerned with Coast Guard electronics. Training is provided through a variety of methods including resident service schools, nonresident courses, on-the-job training (OJT), formal unit or departmental training, training teams, drills and exercises, and personal study. Education is obtained by attending resident commercial institutions and participating in voluntary education programs. Balancing training and education with challenging career assignment patterns contribute to the development of a well qualified, highly motivated work force.

4.2.0.2 References

a. Personnel Manual, COMDTINST M1000.6 (series)
b. Training and Education Manual, COMDTINST M1500.10 (series)
c. CG Philosophy on Training, Education and Development, COMDTINST M1500.23 (series)
d. Pipeline Training for Electronic Technicians (ET) Reporting to Loran Stations, COMDTINST M1543.1 (series)
e. Cutter Training and Qualification Manual, COMDTINST M3502.4 (series)
f. Enlisted Performance Qualifications Manual, COMDTINST M1414.8 (series)
g. Enlisted Qualification Codes Manual, COMDTINST M1414.9 (series)
h. List of Correspondence Courses, CG Institute Pamphlet E 46003
i. CG PMS Work Schedule Book.
j. Catalog of Navy Training Courses (CANTRAC)

4.2.0.3 Philosophy

Training and education is an investment of time and money in our most valuable resource: a dedicated, highly skilled work force. Investments in opportunities for our people are essential to accomplishing assigned missions, staying focused on continuous improvement, and promoting leadership and teamwork. Careful planning and close monitoring of training and education insures an optimum balance of efficiency and effectiveness, maximizing the return on the investments.

4.2.0.4 Contents

This section contains the following topics:

Back to Table of Contents

4.2.1 Feedback and Request

4.2.1.1 Training Feedback

To identify shortcomings or deficiencies in training, technicians need to provide feedback via their chain of command. For existing Class 'C' schools it is important for members and supervisors to complete and return the training follow-on survey. For locally sponsored training, members should provide feedback to their supervisor.

4.2.1.2 New Training Requests

The need for input is just as vital to establish new training requirements as feedback is to existing training. Units or members who believe technical training should be established for specific equipment should report the need via letter to Commandant (G-SRF), via their Chain of command, with a copy to the equipment SMEF. Requests should include the following information:

?? Name and Unit of requester
?? System or equipment requiring training
?? Problem statement
?? POC for questions

Not all equipment or systems qualify for Commandant sponsored training. Equipment that is unique to a unit or has limited installations will probably not be considered for HQ level training. However, training may be required and should be sponsored as directed by the unit's chain of command.

4.2.2 Responsibility

4.2.2.1 Overview

Training is essential for technicians to complete their assigned responsibilities. It is vital for everyone involved to ensure needed training is identified and members are given opportunities to attend.

4.2.2.2 Force Management

Under the general direction of the Director, Systems Resources Directorate, Systems Organization, the Force Management Division will liaison with the training, acquisition, program, support, and facility managers to:

?? Establish training requirements for electronics personnel;
?? Develop the (G-S) master training plans;
?? Review (G-S) sponsored training for applicability; manage special training and education programs; and
?? Recommend cost effective solutions to human performance problems.
?? Develop and manage Enlisted Performance Qualifications for Systems Ratings.
?? Develop and Manage Competencies (old qual codes) for Systems Ratings.

For information or questions concerning the Systems Ratings (ET, IT, EM, MK, AVT, AMT, AST, MK, and SK), visit the Systems Force Management website at http://cgweb.comdt.uscg.mil/g-srf/gsrf.htm.

4.2.2.3 Electronics Material Officer

All EMOs, and supervisors are responsible for training their subordinates. Units shall have a formal training program in place. The program should provide initial orientation training, Personnel Qualification Standards, Performance Based Qualifications, cross training, resident training, and educational opportunities.

4.2.2.4 Senior Technical Personnel

Senior personnel shall encourage and counsel junior personnel on the education and training opportunities available to them, including Off-Duty education, tuition assistance, military schools, distance learning, and correspondence courses.

4.2.2.5 Individuals

All members are responsible for keeping their rating skills and knowledge current. Training is an all-hands responsibility. Education is a personal responsibility. Members should base their skill and knowledge requirements on the current version of the Performance Based Qualifications (advancement quals) members should always maintain an up to date copy as a reference for study. Members should verify that they have the most recent update to the PBQs from the Enlisted Performance Qualifications Manual, COMDTINST M1414.8 (series) or the Human Resources Website at USCG Human Resources - Reserve, Training & Leadership or http://www.uscg.mil/hq/G-W/g-wt/wt.htm. Members are encouraged to review the list of correspondence courses available and enroll in those that will enhance their skills.

4.2.3 Training

4.2.3.1 Overview

There are two types of Coast Guard training that you will be required to complete during your career, job-skills training and career development training. Job-skills training are used to develop technical skills on the maintenance or operations of specific equipment or systems required in performance of a position. Career development training is training required to advance to the next pay grade.

4.2.3.2 Job Skills Training

Job-Skills training is provided to technicians on a just-in-time basis to meet the requirements of a specific billet or mission. Job-skills training are provided through a variety of methods including CG ‘C’ School, commercial schools, or other military services. Training requirements for specific billets can be found in the CTQM for afloat units, for shore units, check your local training plan.

4.2.3.3 Career Development Training

This training is required for advancement to the next pay grade. There are two types of training required, Military Requirements and Rate Specialty. Both types of courses are completed as CG non-resident (correspondence). Each consists of a series of textbooks and an end of course test. Currently, rate specialty training for advancement to ET2 and ET1 (based on the ET2 and ET1 PBQs) is required. You must enroll in the course and successfully complete the test before you are eligible to compete for advancement. See your ESO for instructions and requirements for enrolling.

Also visit the CG Learning Portal at <http://www.uscg.mil/hq/g-w/g-wt/Learning/WTT-Training.htm>. This portal is designed to provide easy access to all types of available training, educational benefits and support for training for all CG Personnel.

4.2.4 Training Centers

4.2.4.1 Training Center Petaluma	Located in Petaluma, CA, Training Center Petaluma conducts class "C" training in communications, navigation, telephone, and Loran systems in support of Coast Guard missions. They also provide training in operating and managing Coast Guard Workstation resources.
4.2.4.2 Training Center Yorktown	Located in Yorktown, VA, Training Center Yorktown conducts class "C" training in fiber optics, Programmable Logic Controllers, and electronic ATON equipment, including the DGPS transmitter suite.
4.2.4.3 Command and Control Engineering Center (C2CEN)	Located in Portsmouth, VA, C2CEN provides training to personnel required to operate and maintain the 210' and 270' endurance cutter classes and the 378' high endurance cutter class Shipboard Command and Control Systems (SCCS). C2CEN also hosts operator and maintenance training on the Integrated Shipboard Control System (ISCS) for both the 175' WLM and 225' WLB Buoy Tenders. Additionally, C2CEN provides training on the Optical Surveillance System (OSS).

4.2.5 Fundamental and Specialized Skills Training

4.2.5.1
Class “A” School

Class "A" schools teach fundamentals of particular ratings and are located at military training centers. This initial training includes both the core and sub-specialty training

4.2.5.2
Electronics Technician

Electronics Technician training takes place at Coast Guard Training Center Petaluma. This general training develops the necessary knowledge and skills to safely use tools and test equipment for installing, operating, repairing and maintaining a wide variety of electronic systems including command and control and tactical computer systems, navigation, surveillance, and communications systems. Upon completion of class "A" school, students may attend applicable class "C" schools to prepare for their first duty assignment.

4.2.5.3
Information Systems Technicians

Information Systems Technician training takes place at Coast Guard Training Center Petaluma. IT class "A" school prepares the IT to install, maintain and repair telecommunication systems encompassing the latest technologies including telephone systems and equipment, voice, data, switching and routing equipment, terminal equipment, telecommunications links, and interior/ exterior telecommunications distribution systems. IT’s are responsible for Coast Guard computer system management at ESDs and capital cutters.

4.2.5.4
Class ‘C’ School

Class ‘C’ schools give detailed instruction on specific equipment or systems. They may be located at either military or civilian facilities. Training for new, specialized or sophisticated equipment is provided through Coast Guard and Navy class "C" schools and Air Force technical schools in various locations. Requests for class "C" schools, except mandatory pre-arrival training, are made on a Short-Term Resident Training Request, form CG-5223, and forwarded to Force Management (G-SRF). Complete instructions for completion and submission of the CG-5223 can be found in FY(current year) Coast Guard Formal Training Schedule, COMDTNOTE 1540. Mandatory pre-arrival training is detailed in Cutter Training and Qualification Manual, COMDTINST M3502.4 (series).

4.2.5.5
Navy Class "C" School

Coast Guard personnel assigned to units responsible for operating and maintaining Navy supported equipment may attend Navy class "C" schools at various locations. Training includes Electronic Warfare (EW), Identification, Friend or Foe (IFF), TACtical Air Navigation (TACAN), radar, crypto logic systems, and communication systems

4.2.5.6
Air Force Technical Schools

Coast Guard personnel may attend Air Force technical schools for fiber optics, communications security, crypto logic systems, and TEMPEST control measures.

4.2.5.7
Leadership and Management

Training on leadership, management, and quality are also available from the Coast Guard and other sources. Personnel are strongly encouraged to take advantage of these training opportunities. Specific requirements and availability can be found in Training and Education Manual, COMDTINST M1500.10 (series) and FY(current year) Coast Guard Formal Training Schedule, COMDTNOTE 1540.

4.2.5.8
Mandatory Pre-arrival Training (PIPELINE)

The process of providing just-in-time training to personnel ordered to duty aboard minimally staffed units. The Coast Guard Training Quota Management Center (TQC) schedules pipeline training for assignments in accordance with current policies, for example the Cutter Training and Qualifications Manual, COMDTINST M3502.4 (series.) and the Pipeline Training for Electronic Technicians (ET) Reporting to Loran Stations, COMDTINST M1543.1 (series).

4.2.5.9
Nonresident training

The Coast Guard offers correspondence courses (non-resident) to all personnel. Some courses are required for advancement in all technical ratings. These courses are designed to teach people skills and knowledge to complete their advancement qualifications. Correspondence courses are also available for subjects related to various mission areas, duties, and equipment peculiar to the Coast Guard. Coast Guard personnel may also enroll in courses available from other services and agencies. Members should contact their Unit Educational Services Officers (ESOs) for assistance in fulfilling enrollment requirements.

4.2.5.10 Contractor Training Courses

Many commercial institutions and trade schools offer short term training programs that may be attended by Coast Guard personnel. These programs are not sponsored by Commandant but may be funded by areas or districts. Unit Electronics Material Officers (EMOs) and Educational Services Officers (ESOs) should route requests through the appropriate chain of command.

4.2.5.11 Non-Military Correspondence Courses

Many trade schools offer correspondence courses in electronics. Financial assistance may be available for this training through the Veteran's Administration or the Coast Guard Tuition Assistance Program. Contact your unit ESO for current policies and procedures.

4.2.5.12 Distance Learning

Distance learning is completed at your unit (no travel required) via the internet, to fit your schedule. The Coast Guard currently has a contract with SMART Force to provide over 400 courses in computers, networks, and software that are available to all members. You can find information about these courses at the CG Learning Portal website. The Learning portal is “designed to provide easy access to all types of available training, educational benefits and support for training for all CG Personnel, to include Active Duty, Reserve, Civilian and Auxiliary.”

4.2.5.13 Team Training

Team training is available from Maintenance and Logistics Commands compliance inspectors, Electronics Systems Support Units (ESUs) and Electronics Systems Support Detachments (ESDs), Navy Fleet Technical Support Centers (FTSCs), installation teams, and contractors. They should be used primarily when on board expertise is limited or unavailable.
Grooms are an excellent opportunity for cutters to receive this training.

4.2.6 Unit Technical Training Program

4.2.6.1 Introduction

Each unit shall have a local technical training program to provide technicians with the skills and knowledge needed to confidently operate and maintain electronic systems required to perform unit missions. The program should prepare technicians for duties and tasks associated with their rating, reinforce basic skills, provide on-the-job training, cross training, and professional development. Training should be performed for at least one hour per week.

4.2.6.2 Required Subjects

The following list provides a minimum list of required training topics. This is only the minimum requirements and should be modified to meet local unit requirements.

?? Annual certification in Cardio-Pulmonary Resuscitation (CPR)
?? Safety requirements and precautions
?? Operational capabilities and testing
?? Maintenance philosophy and procedures, including support and technical assistance chain of command
?? Equipment operation (Operator training)
?? Power distribution
?? System block diagrams and technical manuals
?? Troubleshooting
?? General purpose electronic test equipment (GPETE)
?? Special purpose electronic test equipment (SPETE)
?? Radio Frequency hazards and safety

4.2.6.3 Cross Training

Cross training is a process where each member of the shop is trained to operate and maintain all equipment for which the shop is responsible. The most efficient method of cross training is to receive formal training and follow it with a mix of OJT, PQS, and JQR. The person trained in this manner has an obligation to train other members of the shop. The goal is to provide a shop full of trained technicians for the price of one class "C" school quota.

4.2.6.4 Performance Bases Qualification Training

The advancement qualifications as listed in the Enlisted Performance Qualifications Manual, COMDTINST M1414.8 (series) shall be covered on a semiannual basis. As personnel proficiency increases, the depth of coverage should increase. Properly scheduled, this philosophy will aid the technician in preparing for promotion.

4.2.6.5 Job Qualification Requirement

Job Qualification Requirements are unit-developed checklists or training guides for specific prescribed duties, watches, and procedures not covered by a Personnel Qualification Standard. Shore units in support of their assigned missions shall develop JQRs.

4.2.6.6 Personnel Qualification Standards

The Personnel Qualification Standards program is a cutter qualification program for officers and enlisted personnel. It is modeled after the Navy PQS system. PQS serve as qualification checklists for specific watch stations, duties, and tasks. Combining attendance at formal schools, on-the-job training and personal initiative completes the PQS. Administration of the Coast Guard PQS program is detailed in Cutter Training and Qualifications Manual, COMDTINST M3502.4 (series).

4.2.6.7 Professional Reading

Technical personnel shall be encouraged to read on their own in both technical and military disciplines, participate in voluntary education programs, and perform technical experiments to enhance learning and experience. A half-hour per day reading session will add significantly to professional growth.

4.2.6.8 Documentation

Careful documentation of training and education activities is extremely important to the Coast Guard, the unit, and the member. The Coast Guard must measure the effectiveness and efficiency of training and education investments. Units must monitor their training status to evaluate their ability to carry out assigned missions and better manage their training program. Properly managed Individual Training and Personnel Data Records may be used later for evaluating training and work experience for college credit potentially saving the member thousands of dollars in tuition and book fees at institutions of higher learning.

4.2.6.9 Resident Training Documentation

EMOs and senior technicians shall ensure all successfully completed resident training is documented in a member's Personnel Data Information File through timely liaison with the servicing PERSRU.

4.2.6.10 Individual Training Records

Individual Training Record requirements for Coast Guard Cutters are described in the Cutter Training and Qualifications Manual, COMDTINST M3502.4 (series).

- ?? Shore units shall maintain an equivalent system for managing training. The training officer, department head, or an assigned member should maintain the training records. As a minimum, the training record shall contain the following:
- ?? Completed indoctrination check-off sheets.
- ?? Copies of Administrative Remarks (CG-3307) regarding PQS/JQR qualification and/or requalification. Copies of Individual's Record of Small Arms Training (CG-3029A).
- ?? Formal school completion letters or certificates. Copies of correspondence course completion letters.
- ?? Copies of Performance Based Qualifications Sheets and correspondence related to advancement or promotion.
- ?? Record of lectures attended on general military training, departmental/ divisional training or those associated with professional development programs (law enforcement, OOD training, etc.).
- ?? Miscellaneous training records and information.

4.2.6.11 Departmental Training Record

The method used to document unit and departmental training is largely dependent on the unit type and size. Use of the Weekly Training Plan (CG-5288), Departmental Training Record (CG-5289), and the Record of Drills and Exercises (CG-5290) are required on floating units and highly recommended at other units. These tools are easily used for both planning and record keeping.

4.2.6.12
Lesson Plan Outlines

All training should have a lesson plan outline (LPO). The LPOs can be a single sheet or a collection of sheets depending on the nature of the training. The EMO or senior technician for future use shall maintain departmental LPOs. Examples of LPOs are shown at the end of this section. Regardless of the subject matter, all LPOs should have the following information.

1. **LPO Identification**. The identifying information should facilitate training planning, record keeping, and ease of filing. For example, OPFAC-TOPIC-PLAN or 98-70098-SAFETY-004 as shown at the end of this section.
2. **Safety**. CLEARLY STATE ANY SAFETY CONSIDERATIONS. There shall be no compromise to safety of personnel and equipment.
3. **Objectives**. The objectives should be clearly stated. What do you want the participants to know or do after receiving the training?
4. **References change**. You should include a list of all references used to prepare the lesson and ensure they are current.
5. **Training Aids**. List of training aids used. List their storage location.
6. **Tools and equipment**. List all tools and equipment used in the demonstration or required for actual job performance.
7. **Expendable materials**. List all consumable materials required for the training such as wire, fuses, forms,
8. **Delivery plan**. Identify the actual lesson activities and how long allotted to each, i.e. 10 minutes lecture and demonstration and 45 minutes hands on practice.
9. **Outline**. Prepare an actual outline to use during the training to ensure continuity and logical progression.

4.2.7 Educational Development

4.2.7.1 Education Introduction

Training provides specific skills; education provides specialized and general knowledge. The Coast Guard sponsors the ACET program to provide enlisted technical personnel with skills and knowledge beyond that available form ‘C’ Schools or correspondence courses.

4.2.7.2 ACET Education

The Advanced Computer, Engineering, and Technology Program (ACET) is available on a competitive basis to qualified petty officers, E-6 to E8, in the ET, IT, EM, AVT, or MK rates. The objective of the program is to produce highly skilled technicians and engineer's assistants. Participants in the ACET program are provided up to two years full-time college attendance to complete a degree program in engineering or technology. Graduates can expect assignment to Headquarters, headquarters’ units, major support units, or large shore units. “Specific application procedures and requirements are published in an ALCGENL and ALCOAST each spring. For more information on the ACET program, visit the ACET website at http://cgweb.comdt.uscg.mil/g-srf/acet.htm.

4.2.7.3 Advanced Electronics (AAIWSM)

Advanced theory, maintenance, repair, and systems engineering are taught at the Navy Advanced Avionics Integrated Weapons Systems Maintenance School, at Naval Aviation Technical Training Center (NATTC), Pensacola, Florida. Quotas for AAIWSM School are limited and available to enlisted personnel, E5 to E7, in the ET, and AVT ratings on a competitive basis.

4.2.7.4 Officer Advanced Education

Education that leads to a Masters Degree in electrical/electronic engineering, computer science, or technology management. This program is available to qualified commissioned officers on a competitive basis. Graduates can expect assignments to Commandant (G-S) at Coast Guard Headquarters, Operations Systems Center (OSC) Martinsburg, West Virginia, Telecommunications and Information Systems Command (TISCOM) Alexandria, Virginia, Command & Control Engineering Center (C2CEN) Portsmouth, Virginia, Loran Support Unit (LSU) Wildwood, New Jersey or the Research and Development (R&D) Center in Groton, Connecticut. Specific application procedures are outlined in Training and Education Manual, COMDTINST M1500.10 (series).

4.2.7.5 Voluntary Education Programs

All personnel should be encouraged and assisted in pursuing higher education through voluntary education programs. The Coast Guard Institute provides numerous services associated with voluntary education. Consult you local ESO for details or assistance.

4.2.8 Career Development

4.2.8.1
Career Progression

During an ET's career he can expect a wide variety of assignments and responsibilities. This section provides an overview what an ET can expect through a career. The list below provides a summary of the responsibilities of the respective ranks.

Rate	Responsibility
ET3:	Configure, Operate, Perform Planned Maintenance, Minor Corrective Maintenance, and locate and use supplies.
ET2:	Same as above AND Install, Modify, Document, Procure supplies and parts, One-on-One supervision, and Technical Training on installed equipment.
ET1:	Same as both above AND Supervision of technicians (multiple), Maintenance Scheduling, Establishing Equipment Capabilities, Training on Coast Guard processes/procedures.
ETC:	All the above AND Budget Development AND Management, Training Management, Identifying Equipment Requirements, Liaison with outside entities on Technical Issues, Local Level Project Management, Contracting, Development of Equipment Changes.
EMO:	All the above AND Supervision within remote AOR, Multi-Unit Budget Development, Multi-Unit Training Requirements, Multi-Unit Project Management, "All" aspects of career mentoring to people in and out of rating, Liaison with Management (Officers) CG wide, on technical and personnel issues.

4.2.8.2
Advancements

The normal path of advancement starts with graduating from ET 'A' School and progresses to ET2, ET1, ETC, etc… For senior technicians (ET1 and above), there are opportunities to diverge from the standard path of ETC, ETCS, ETCM. These include competition and promotion to CWO (ELC), an opportunity to promotion to Lieutenant or application and selection to the Direct Commission Engineer program. Advancements are an individual initiative. Members must take the initiative to prepare themselves for advancement, no one is going to hand you advancement, and you must apply yourself.

4.2.8.4 Career Progression Table

Rate	ET3	ET2	ET1*	ETC	ETCS	ETCM
# Years	1 – 2	2 – 4	4 – 8	8 – 13	13 – 17	17 – 22
Officer				CWO	CWO	CWO
DCE*				LT	LT	LT

Table 4.2-1Career Progression

NOTE:
DCE selection is based on time in service, pay grade, education, & experience. Contact program manager (Commandant (G-SRF)) for additional requirements.

4.2.8.5 Advancement Qualifications

Advancement qualifications are those skills, which must be mastered to qualify for advancement to the next higher enlisted pay grade. The qualifications are updated periodically to reflect changes to a particular rating's work environment. The advancement qualifications are the basis for class "A" school and correspondence course curricula.

Advancements have several requirements, Complete your Rating specialty correspondence courses, complete your PQS for the pay grade, complete your military requirements, and receive the recommendation of your Commanding Officer. Specific advancement requirements are contained in the Personnel Manual, COMDTINST M1000.6 (series) and published through semi-annual ALCOAST messages.

4.2.8.6
ET Assignments

Electronic Technicians can expect a broad array of assignments both ashore and afloat. Upon graduation from A school, new technicians may receive assignments to Communications Stations (COMMSTA), Loran stations, major cutters (210 above), ESUs/ESDs or a Center of Excellence (COE). Members are encouraged to work with a mentor to develop a career plan, this plan should allow the member to take maximum advantage of duty assignments, training, and education opportunities to provide for professional growth and experience with the goal of developing the member's full potential. As you progress in your career and gain experience you will have more responsibilities and opportunities. As you select assignments you should seek new challenges to expand your experience.

Members are highly encouraged to apply to sea duty assignments as part of their career progression. Sea duty assignments provide members with outstanding opportunities for career growth, gain experience, and increased advancement potential.

NOTE:
There is a sea duty requirement to advance to ET1 and ETC. Refer to the CG Personnel Manual, COMDTINST M1000.6 (series) for specific requirements.

LESSON PLAN OUTLINE
98-70098-SAFETY-004

HAZARDOUS CONDITION NOTIFICATION PROCEDURES

SAFETY PRECAUTIONS: No hazards to personnel or equipment this lesson.

OBJECTIVES:

1. **STATE** the informal procedure for reporting hazardous conditions.
2. **PREPARE** an Employee Hazardous Condition Report (CG-4903)

REFERENCES: Safety and Environmental Health Manual, COMDTINST M5100.47 (series), Chapter 3 and Enclosure (1)

TRAINING AIDS: Transparency,.CG-4903 Form
TOOLS AND EQUIPMENT: Overhead projector
EXPENDABLE MATERIALS: 30 Copies of the Form CG-4903
DELIVERY PLAN: 5 Min Discussion; 10 Min Demonstration; 15 Min practice

OUTLINE:

A. Introduction

   1. Informal reporting procedure to supervisor
   2. Consequences of NOT reporting hazards

B. Formal Reporting

   1. Employee Hazardous Condition Report (CG-4903) block by block description.
   2. Give students scenarios.
   3. Have students prepare the report.
   4. Show them the transparency after you mark it up.

C. Feedback and Discussion

INSTRUCTOR NOTES:

LESSON PLAN OUTLINE
07-31299-MAINT-001

ELECTRONIC TROUBLESHOOTING PROCEDURES

SAFETY PRECAUTIONS: Standard electrical safety precautions apply.

OBJECTIVES:

1. **PERFORM** standard troubleshooting procedures per the Electronics Manual, Chapter 11.
2. **COMPLY** with group policy regarding troubleshooting and repair of Depot Level Repairables (APA and NONAV)

REFERENCES: Electronics Manual, COMDTINST M10550.25 (series)
APA Repairable Electronics Program, E/GICPINST 4408.1J
MLCLANT SOP, ANNEX K, Command and Control Systems
Group Electronics Doctrine, USCG Group Warmsand Instruction M10550.1

TRAINING AIDS:
1. Transparencies:
2. Troubleshooting flow chart
3. AN/URC-1000 Block Diagram
4. AN/URC-1000 Power Supply Regulator Module Schematic Diagram
5. DD-1577/2 Unserviceable Tag

TOOLS AND EQUIPMENT: Overhead projector, AN/URC-1000 (spare unit), Oscilloscope, Digital multimeter, In-line Wattmeter, Transistor test set, cables
EXPENDABLE MATERIALS: NONE
DELIVERY PLAN: Lecture & Discussion; 10 Min Demonstration; 10 Min Practice; 10 min per student

OUTLINE:

A. Troubleshooting Procedure

1. Symptom Recognition
2. Symptom Elaboration
3. Sectionalizing - Listing probable faulty function(s)
4. Localizing the faulty function
5. Isolating the failed function/module/component
6. FAILURE ANALYSIS ****The crucial step before repairing****

B. Group Repair Policy

1. ALL equipment failures shall be analyzed to the lowest possible level. If you have access to the component for test purposes, then component level troubleshooting is required. Repair policy shall be whatever applies per higher authority, BUT the DD-1577/2 shall detail as closely as possible the nature of the failure.

2. Group corrective maintenance reporting procedures

3. Casualty Reports per NWP-10-1-10

C. Troubleshooting Drills AN/URC-1000 All Mode Transceiver

D. Feedback and Discussion

INSTRUCTOR NOTES:

Seek troubleshooting problems for any equipment from the equipment

History logs.

Observe the technicians application of knowledge of theory to their use of test equipment, drawings and the technical manual.

Closely monitor their safety practices!

5.0 Process Management

5.0.1 Overview

This section sets forth the key aspects of the electronics' community customer focus, service and product delivery processes and how we support electronic equipment.

5.0.2 Objective

To articulate and standardize the process the Coast Guard's electronic community uses to:

?? Manage product design,
?? Ensure timely delivery of goods or services, and
?? Provide superior support.

5.0.3 Contents

This section contains the following topics:

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5.1 Product and Services Processes

5.1 Definition

Processes govern how different parts of the Coast Guard Electronics Community interact, both with themselves and other communities. Over time, changes in the Coast Guard necessitate review and possible revision of these processes.

5.1.1 Scope

This section establishes procedures for review and revision of processes used with in the electronics community of the Coast Guard, as promulgated in this Manual.

5.1.2 Authority

The Office of Electronics Systems (G-SCE) shall be the change authority for processes used throughout the electronics community, where those processes affect more than just one command structure.

5.1.3 Requests

Requests for process changes shall be sent in writing (letter or e-mail), via chain of command, to Commandant (G-SCE). This letter shall identify the process(s) and include recommended change(s).

5.1.4 Representative

A member of the Commandant (G-SCE) staff shall be assigned as the Commandant (G-S) Process Change Representative. If necessary, the representative shall determine which CG units, HQ directorates, and other entities need to be involved in the process change.

A representative from Commandant (G-SCE) shall contact the appropriate entity and solicit input regarding the recommended change. After receipt of the input, Commandant (G-SCE) shall review the information, and arrange a meeting between Commandant (G-SCE) and the units involved, in order to work through the differences, and arrive at a solution that meets Coast Guard engineering objectives.

5.1.5 Solution

The solution shall be promulgated via official letter from Commandant (G-SCE), or incorporated into a Commandant Instruction, or other documentation as appropriate.

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5.2 Support Processes

5.2.0.1 Overview

The processes we do to support our own jobs – finance and accounting, information or knowledge management, administration – is critical to performing our missions. This section articulates the expectations of the Program Manager and provides guidance on key business areas.

5.2.0.2 Objective

To express the expectations and set forth the policy to manage

?? Acquisitions,
?? Budgeting,
?? New projects,
?? Property,
?? Maintenance,
?? Test equipment (TE),
?? Alterations, and
?? Allowancing.

5.2.0.3 Contents

This section contains the following topics:

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5.2.1 Acquisition and Procurement

5.2.1.1 Introduction

This section provides policy, information and procedures for acquiring automated information systems hardware/software, electronic systems, telecommunications systems, digital voice recorders, other systems not purchased or support by Hull Mechanical and Electrical (HM&E) funds, and spare parts to supported installed systems.

5.2.1.2 Definitions

The following definitions will help you understand the contents of this section.

5.2.1.2.1 Electronic Sensors

Electronics sensor equipment and systems, including but not limited to shipboard radar systems, radio direction finders, navigation receivers depth finders, navigation systems including LORAN-C, DGPS, marine radio and radio beacons and electronics short range Aids to Navigation. Systems utilizing voice, data, radio, wire and fiber and Digital Voice Logging (DVL) equipment.

5.2.1.2.2 Acquisition

Acquisition is the process of acquiring hardware, software or services. It requires long-term planning, budgeting, procurement, installation, and testing. Acquisition should not be considered as merely receiving delivery of equipment. Maintenance and support functions take over once acquisition is completed this is the operational and sustainment phase. Acquisition planning does include maintenance considerations to ensure a smooth hand-off once operations start.

This is a major part of the acquisition process.

5.2.1.2.3 Procurement

Procurement is tightly governed by statutes and the Federal Acquisition Regulations (FAR). Procurement is the process of taking a requirement and funds, and turning them into a legal contract. Procurement usually starts once the budget process is complete and funds are available. Depending on the scope of the contract, procurement may cover one phase of the acquisition process (e.g., purchase of hardware or testing and installation) or it could encompass most of the whole acquisition process (e.g., turn key operation—design build, install, and maintain the equipment/system.)

5.2.1.2.4 Acquisition and Procurement Process

The Acquisition and procurement are reasonably well ordered processes. Under normal conditions it is a clear-cut step-by-step procedure. Problems arise, however, when all steps are not completed, insufficient time is available or personnel are not available.

5.2.1.2.5 Major Acquisition Process

The Major Acquisition Process (i.e. acquisitions which exceed $50M or selected acquisitions that require special management attention, normally between $5M and $50M) is detailed in Major Systems Acquisition Manual, COMDTINST M4150.2 (series) and should be referred to for step-by-step guidance.

5.2.1.2.6 Non-Major Acquisition Process

Non Major Acquisition Purchases are from $100K to $5M.

5.2.1.2.7 Simplified Acquisition Process

Simplified Acquisitions Process (i.e. purchases up to $100K) is detailed in COMDTINST M4200.13 (series) and should be referred to for step-by-step guidance.

5.2.1.2.8 EILSP

Equipment/System Integrated Logistics Support Plan (EILSP), COMDTINST M4105.7 (series) provides guidance from system acquisition, through life cycle maintenance and system disposal. You can find EILSP's for most CG supported equipment at the following websites:

http://www.uscg.mil/hq/lsu/webpage/eilsp.htm,
http://cgweb.lant.uscg.mil/c2cen/fr_in.htm, or
http://cgweb.tiscom.uscg.mil/ops2/eilsp/eilsp1.htm .

5.2.1.3 Availability of Funds

Before any procurement can be started, funds must be available. It is the project officer's responsibility to verify funds are available before starting any procurement activity. There are several types of funding that will be encountered and terminology to be familiar with.

5.2.1.4 Operating Expenses

Provides for the operation and maintenance of all authorized Coast Guard programs not otherwise specifically funded. Operating Expenses are broken down into operating guides. These funds must be used in the year that they are allocated and cannot be carried into another fiscal year. "Operating Expenses" appropriations where estimated costs of a project are $125,000 or less, or where renewals and replacements involve less than 75% of the original facility. These funds are multi-year funds (5 years usually) and can be carried over to subsequent fiscal years, subject to the AC&I Manager's (G-E) discussion. The Planning & Programming Manual Volume II (Field Planning Manual), COMDTINST M16010.6 (series) provide detailed criteria for OE and AC&I funding.

5.2.1.5 Appropriated Funding

Allotment Fund Control (AFC) Codes represent a breakdown of OE funds. They are flexible obligation ceiling levels. Each AFC has a specific purpose for which the funds must be used. The two operating guides you will usually encounter are AFC-30 and AFC-42. For information on AFC codes and a list of funding see Block 5.2.3.3.1.1.

5.2.1.6 Operating and Maintenance Funds

Operating and Maintenance funds were established for normal and ordinary operating costs for each OPFAC unit (e.g., office supplies, phone bills, office equipment, etc.)

5.2.1.7 Electronic Program Funds

Electronics Program funds established for acquisition, installation, maintenance of ground and ship based electronic equipments including communications equipment and Aids to 'Navigation (e.g. ILS) used to support aircraft operations. Chargeable items may be provided or performed by commercial concerns, other Government agencies, CG Integrated Support Command, ESU/ESD CG personnel.

5.2.1.8 Apportioned Funds

The above funds are apportioned out according to the needs. AFC-42 funds are apportioned to MLCs and headquarters units by Commandant (G-SCE) according to an allocation formula that considers the existing plant, new requirements and special requests. AC&I funds are apportioned by the AC&I funds manager in accordance with AC&I project plans.

5.2.2 System and Equipment Management

5.2.2.0.1 Introduction

This chapter provides information and direction for Systems Management and Engineering Facilities (SMEF) and Equipment Managers. It explains the difference between the two concepts and assigns responsibilities.

5.2.2.0.2 References

a. Coast Guard Engineering Logistics Concept of Operations ((ECONOP), COMDTINST M4100.7 (series)
b. Grounding, Bonding and Shielding, MIL-HDBK-419A
c. Grounding, Bonding and Shielding, MIL-STD-188-124B
d. Major Systems Acquisition Manual, COMDTINST M4150.2 (series
e. Configuration Management Guidance, MIL-HDBK-61A
f. Naval Engineering Manual, COMDTINST M9000.6 (series)
g. NAVSHIPS Technical Manual, chapter 9670, Electronics, NAVSHIPS 0901-LP-670-0002 (series)
h. Shipboard Antenna Systems, Volume 2, NAVSEA 0967-LP-177-3020 (series)
i. Electronic Installation and Maintenance Book (EIMB), NAVSEA SE000-00-EIM-XXX (series)
j. Standard Practices for Shipboard Bonding, Grounding and Other Techniques for Electromagnetic Compatibility and Safety, MIL-STD-1310 (series)
k. Field Changes And Field Change Kits, MIL-STD-2039
l. Integrated Logistic Support Supply Handbook; 0530-LP-548-0010, Preparation Of NAVSUP PUB 548
m. NAVSEA Program Manger Guide
n. General Guidelines for Electronic Equipment, MIL-HDBK-454
o. EIA CMB 4-3
p. EIA649 National Consensus Standard for Configuration Management
q. ECP Form number instructions
r. SIR Form number instructions
s. NWP 10-1-10 CASREP

NOTE:
A cross-reference guide is provided on the following web site, which may be used to identify the appropriate SMEF/equipment manager: http://cgweb.comdt.uscg.mil/g-sce/sce-2/. It is recommended technicians on board cutters download a copy of this guide prior to their vessels departure on patrol.

5.2.2.0.3 Contents

This section contains the following topics:

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5.2.2.1 History and Relevance

5.2.2.1.1 Support Manager

All electronic equipment or systems shall have a support manager assigned in Commandant (G-SCE-2). This manager shall be responsible for the life cycle support of the program assigned and shall provide guidance for policy, planning and financial matters. This includes drafting Resource Proposals (RP) reviewing life cycle costs and submitting annual Integrated Budget Development System (IBUDS) entries and submitting Total Cost of Ownership (TCO) data to the TCO Manager. TCO Manager is located in Commandant (G-SCE).

5.2.2.1.2 Relevance to CG units

The SMEF or Equipment Manager indirectly provides vital services to technicians via their appropriate MLC/ESU/ESD, including:

?? Identifying repair or replacement options for aging or high failure items,
?? Technical assistance to the technician's support chain of command,
?? Issuing Field Changes and
?? Configuration management for all supported equipment.

Each technician shall ensure the appropriate SMEF or equipment manager is an addressee on all message traffic concerning the electronic equipment. Should two or more systems or equipment suites for which there are different SMEFs or Managers be integrated, all relevant SMEFs and Managers shall be addressees in the message traffic.

5.2.2.1 History and Relevance, Continued

5.2.2.1.3 Scope of Equipment Management

Excluding aircraft, fire control systems and ship engineering control systems, there are over 9,000 different types of electronic equipment with a total population of 120,000 items. Additionally, the population of electronics components and systems used within the Coast Guard has steadily increased as a result of the incorporation of sophisticated electronics circuits and advanced control systems in many previously mechanical systems.

5.2.2.1.4 History

In the past, the Electronics Systems Division at Headquarters has been a multi-faceted organization managing all aspects of electronics engineering;

- ?? Design and acquisition of electronics equipment,
- ?? Installation of equipment or systems,
- ?? Evaluation of beneficial suggestions,
- ?? Evaluation and promulgation of field changes and
- ?? Maintenance of existing equipment.

The requirement for increased effectiveness in all these tasks dictates a decentralization of responsibilities.

5.2.2.1.5 SMEF Concepts

The concept of SMEF was created to specifically unite the Systems Management functions to the Engineering Facility to reap synergistic benefits from the two being co-located. Because the SMEF has the Engineers, System Managers and significant baseline facilities at their disposal, the SMEF has very broad responsibilities. This includes the authority to issue field changes, software releases and direct liaison with all levels of the Coast Guard. Although SMEF is frequently used to indicate the person(s) acting as the System Manager, it is important to note the SMEF is the entire command, not just one person.

5.2.2.1.6 Function of System managers

The functions of a system manager are intended to be primarily management functions and, as such, do not imply a requirement for large engineering or technical staff. The system manager and engineering staffs are functionally separable but have related responsibilities. The system manager shall perform the following specific life cycle functions with regard to the system, equipment or software product assigned:

?? Maintenance Management
?? Configuration Management
?? Performance Monitoring
?? Technical Liaison
?? Dissemination of Technical Information

Detailed explanations of these specific functions are provided further into this chapter.

5.2.2.1.7 System Manager Relationship

The engineering staff's prime responsibility is to prosecute engineering projects assigned by Commandant (G-S). The establishment of the system management function at the engineering facility does not alter that responsibility. However, the System Manager shall be able to draw upon the technical expertise of the engineering staff, using guidelines formally established by the Commanding Officer.

5.2.2.1.8 Depot Level Support at a SMEF

The prime responsibility of an electronic repair depot is the repair of APA repairable electronic items that are under the control of the Inventory Control Point at the Engineering Logistics Center (ELC) Baltimore, MD. Establishment of depot facilities and assignment of depot repair responsibilities remain the responsibility of Commandant (G-S).

5.2.2.1.9 SMEF Assignment Overview

Not all equipment requires assignment of a SMEF. A SMEF is usually assigned when the equipment has a significant impact on another system or mission completion. Where a SMEF is not assigned, Commandant (G-SCE) may assign an Equipment Manager. Diagrams 5.2.2-1 and 5.2.2-2 are provided as a guide to SMEF assignment.

5.2.2.1.10 When is a SMEF Assigned?

Diagram 5.2.2-1 is used to determine whether or not a SMEF should be assigned. The two driving factors are mission completion and impact on/with existing systems. The other factors account for high numbers (population) of equipment in the fleet, the complexity of the system and the cost of the equipment.

5.2.2.1.11 Which SMEF?

Diagram 5.2.2-2 is used as a guide to determine which SMEF should be assigned based on the existing Coast Guard infrastructure. The driving influence is the existence of another system or functionality assigned to one of the existing SMEF's. In the event the matrix does not produce a definitive answer, the default is for Commandant (G-SCE) to assign a SMEF.

5.2.2.1 History and Relevance, Continued

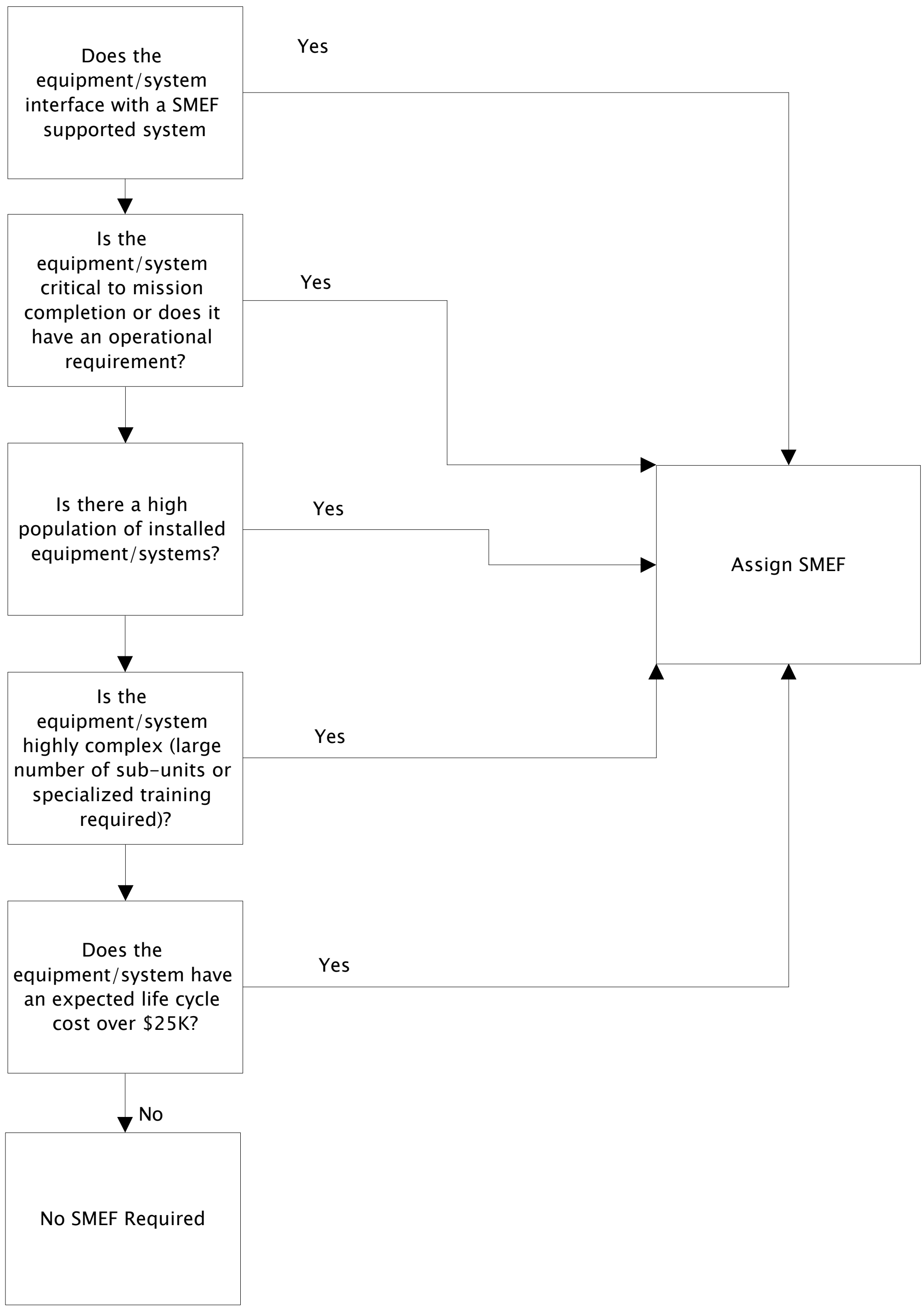

Diagram 5.2.2-1
When is a SMEF Assigned?

5.2.2.1 History and Relevance, Continued

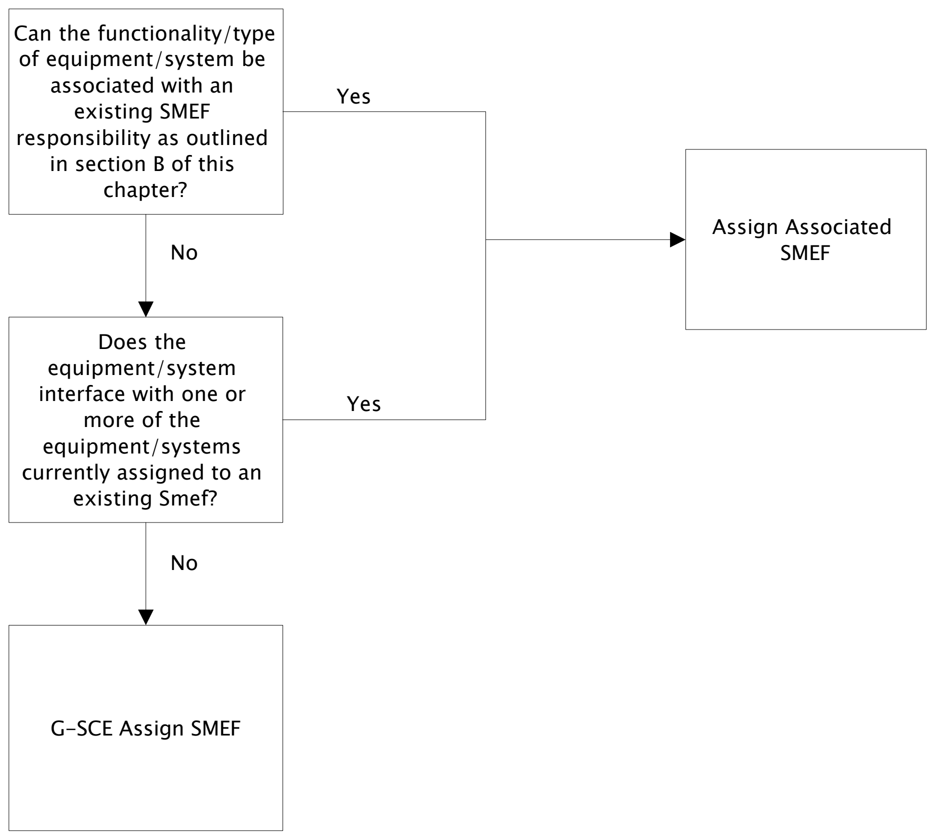

Diagram 5.2.2-2
Which SMEF?

5.2.2.2 Responsibility

5.2.2.2.1 Commanding Officer's Responsibility

Once assigned as a SMEF, Commanding Officer of the SMEF shall:

- ?? Assume SMEF responsibilities for the assigned electronic system, equipment or software.
- ?? Submit a notice to Commandant (G-S) for promulgation to the field when they assume responsibility for the system, equipment or software.
- ?? Establish technical liaison with Maintenance and Logistic Commands, ELC, other Headquarters Units, districts and operational field units via the chain of command.
- ?? Adhere to the requirements set forth in this chapter.

5.2.2.2.2 Headquarters

Headquarters has management responsibility for all systems, equipment, and software products. Due to technical knowledge, field awareness, and maintenance management responsibilities for assigned systems/equipment within the Coast Guard, the SMEF's System Manager is a valuable information resource for assisting Headquarters in establishing new maintenance and management philosophies. The System Manager can provide information on training, logistics, installation, configuration management, phase-outs, operational requirements, data management, and maintenance.

5.2.2.2.3 Area, MLC and Districts

Area, Maintenance Logistic Commands, and District Commanders shall refer all matters concerning equipment and computer software maintenance and configuration management for the supported equipment and software to the appropriate SMEF. Commandant (G-S) will make formal notification of assignment of SMEF responsibilities. The commanding officers shall also ensure the local maintenance doctrines reflect SMEF policies and procedures as appropriate.

5.2.2.2 Responsibility, Continued

5.2.2.2.4 Direct Technical Assistance Requests

Because of the SMEF's unique technical expertise, it may occasionally receive requests from MLCs, ELC, districts or field units, via the chain of command (e.g.: CASREP) for direct technical assistance in the nature of intermediate level maintenance assistance. Such services are normally beyond the scope of SMEF responsibilities and SMEF's are not staffed or funded to provide capability for extensive intermediate level assistance. SMEF's may provide such services, if they do not significantly impact the assigned SMEF, project engineering or depot responsibilities.

5.2.2.2.5 Commanding Officer of the SMEF

The Commanding Officer of the SMEF shall ensure the following configuration management functions are performed:

- ?? The SMEF shall define methodology of processes and ensure procedures are established to support the assigned system throughout the fielded lifecycle for system management and change control. Commandant (G-SCE) may review this process.
- ?? Maintenance and control of the master technical data and the master equipment suite that define the Configuration Baseline (CB), which will include a Configuration Item (CI) listing of hardware, software and firmware considered maintenance worthy by the SMEF.
- ?? Evaluation of all proposed changes to the Configuration Baseline including parts substitution.
- ?? Management of the implementation of all approved changes to the set of approved configuration.
- ?? Configuration status accounting and reporting procedures.
- ?? Monitoring of the field configuration through processes and procedures defined by the SMEF.
- ?? The SMEF shall maintain all defined requirements and control changes to those requirements in accordance with a defined and established Local Configuration Control mechanism.

5.2.2.3 Supporting Equipment

5.2.2.3.1 Maintenance Management Process

The SMEF must actively participate in the maintenance management process to perform specific SMEF functions. The requirement for managing maintenance varies depending on who provides maintenance, what maintenance consists of, and how maintenance is accomplished.

5.2.2.3.2 Engineering Logistics Center

Because of common interests and the number of routine requests, required direct communications (including support requests) between the SMEF and the ELC is authorized. The ELC shall refer all matters concerning equipment and computer software maintenance and configuration management for the selected equipment and software to the System Manager at the appropriate SMEF. The ELC shall ensure CGPMS and local maintenance doctrines reflect SMEF policies and procedures as appropriate.

5.2.2.3.3 Who should support?

Support for equipment or software products can be maintained by the developer, a contractor, or by a dedicated in-house group. The ideal group for maintaining a system is usually the developer. A better, more supportable product will be created if the developer knows the maintenance support will be their responsibility as well. The engineering staff within the SMEF works closely with the system management/ support staff during the requirements phase of any assigned project.

5.2.2.3.4 EILSP

The Equipment/System Integrated Logistics Support Plan (EILSP) and the Systems Requirements Specification should state who shall provide maintenance and at what level. "For new equipment, the appropriate Equipment/Systems Manager, working closely with the Project Manager, will develop the EILSP and associated ESS. (See Enclosure (2), Equipment/System Integrated Logistics Support Plan (EILSP) Development Decisions). For existing systems, the appropriate Equipment/Systems Manager is responsible for the development or updating of the documents". Reference Equipment/System Integrated Logistics Support Plan (EILSP) and Equipment Support Sheet (ESS) Development and Maintenance Responsibilities, COMDTINST 4105.7 (series).

5.2.2.3.5 Aging or Unsupportable Equipment

Electronic equipment is expected to have a service life of eight years. The process of replacing aging or unsupportable equipment is time consuming and requires advanced planning. The System Manager shall identify material to be submitted to the Electronic System's replacement and replenishment (AFC-42) program IAW this Manual.

5.2.2.3 Supporting Equipment, Continued

5.2.2.3.6 Liaison to Inventory Control Points (ICPs)

The System Manager shall maintain liaison with the appropriate stock point ELC, Defense Logistics Agency (DLA), commercial contractor, etc.) and provide technical advice to the item manager at the stock point as required.

5.2.2.3.7 Software Management

Management philosophy for software differs from that of hardware primarily in the area of change management.

5.2.2.3.8 Configuration Management Importance

A major responsibility of the SMEF is Configuration Management (CM), which is a means for managing technical engineering documentation and the "as-built" product. Configuration Management is also a process for controlling changes affecting both the equipment and it's documentation. Each SMEF shall identify a process and any procedures, which shall be employed to manage and control changes in system configurations.

5.2.2.3.9 Start and Stop points for CM

Configuration Management is a discipline, which is initiated in the engineering phase of the equipment's life cycle and continues throughout the equipment's life until the equipment is properly disposed. Configuration Management applies technical and administrative direction to:

?? Identify and document the functional and physical specifications of electronic systems, equipment and/or software – Engineering function.
?? Control changes to those specifications – System manager function.
?? Records and reports configuration changes – System Manager function.

5.2.2.4 Definitions

5.2.2.4.1 Configuration

The configuration of an item refers to its functional and/or physical characteristics. Functional characteristics generally refer to broad system requirements, such as range, speed or reliability. Physical characteristics are the form, fit or function details of the item.

5.2.2.4.2 Configuration Item

A configuration item is simply any equipment item or system designated for configuration management. Additional criteria for designating an items as requiring configuration control are

a. End-item function critical to mission capability;
b. Technical data required to operate and maintain; and
c. Safety, health or security are of concern during design, manufacture, fielding and;/or disposal.

Further guidance is provided in the Coast Guard Configuration Management Manual, COMDTINST M4130.6 (series).

5.2.2.4.3 Configuration Identification (CID)

Configuration identification is the process of defining the hardware, software and documentation that will constitute a configuration baseline. CI identification is the common reference identifier used in configuration audits, configuration control and a Configuration Status Accounting (CSA) system for integrating and interfacing all related technical and logistics information. CI's, CSCI's for Computer Software CI's, and their configuration documentation shall be assigned unique identifiers.

Computer software identification is the responsibility of the developing agency. For each CSCI and associated software units the contractor shall issue/obtain an alpha-numeric software identifier, which shall consist of a name or number, and a version identified and shall relate the software to its associated software design documentation; revision; and release date. The contractor shall embed the software version identifier when the source code, and provide a method for display of software and version identifier data to the user upon command.

5.2.2.4.4 Configuration (CB)

The approved configuration at specified time; the set of all approved Configuration Identifications.

5.2.2.4.5 Configuration Control

The systematic evaluation, coordination, approval or disapproval and implementation of all approved changes to the configuration item which may be applied during development and after formal establishment of the Configuration Baseline.

5.2.2.4 Definitions, Continued

5.2.2.4.6 Configuration management

Configuration management (CM) is the discipline of providing systematic and uniform configuration identification, control and accounting of equipment and software. The objectives of CM are to identify and document the characteristics of a Configuration item (CI); to control changes to these characteristics; to provide information on the status of change actions; and to audit and review the item for compliance with contractual and identification requirements.

5.2.2.4.7 Configuration Change

An approved change to configuration identification. A current Configuration Baseline plus a Configuration Change results in a new Configuration Baseline.

5.2.2.4.8 Configuration Control Board

A group of people who determine if the proposed change to the equipment/system meets the field requirements without adversely affecting the other equipment at the asset. Responsible for review and approval of all Type 1 ECP's – See Section 5.2.7.

5.2.2.4.9 Configuration Manager

That individual responsible for Configuration Management of a given system, equipment and/or software product.

5.2.2.4.10 Configuration Status Accounting

The process of documenting, recording and reporting information regarding the current Configuration Baseline, the history of changes to the Baseline, pending changes to the Baseline and the implementation status of approved changes.

5.2.2.4.11 Submitting ECR's

A proposed change to a configuration item. Guidance for submitting ECRs can be found in Section 5.2.7 of this Manual and the Naval Engineering Manual, COMDTINST M9000.6 (series).

5.2.2.5 Engineering Change Request

5.2.2.5.1 **Class I Change**	A Class I change will change the specified operating characteristics or performance of the equipment or software product. The change will have a significant impact on the logistics support; training or maintenance support structure and policies for the equipment or software product; will require action through the budgetary process to obtain new resources; or cannot be implemented with current SMEF resources.
5.2.2.5.2 **Class II Change**	Class II changes will not change the specified operating characteristics or performance of the equipment of software product; will not have a significant impact on the logistics support, training or maintenance support structure and policies for the equipment or software product; and can be implemented with existing SMEF resources.
5.2.2.5.3 **Budgets for ECR's**	The following general budgetary procedures will apply to configuration changes:
5.2.2.5.3.1 **Type I Funding**	The Commanding Officer of the System Management and Engineering Facility shall provide budgetary estimates and schedules with a Class I preliminary engineering change proposal when it is submitted for approval. When the preliminary engineering change proposal is approved, Commandant (G-S) will provide funding and method of implementation guidance.

5.2.2.5.3.2
Type II Funding

A base level of funding will be provided annually to the SMEF for assigned equipment. This funding should be adequate to meet administrative costs and to fund the requirements for all anticipated Class II changes to be implemented during the fiscal year. SMEF funding requirements shall be identified on the facility's annual budget request.

5.2.2.5.4
DoD CM policies

Configuration Management policies and procedures have been formalized in many Department of Defense (DoD) directives and publications. The SMEF configuration management procedures reflect the basic functional objectives of more formal configuration management systems, but have been tailored to meet Coast Guard systems requirements.

5.2.2.5.5
Three types of Configuration Baselines

There are three types of Configuration baselines employed by the configuration management discipline; functional, allocated, and product. These baselines provide for the progressive definition and documentation of the requirements and design information describing CI's:

?? Functional Baseline, is commonly defined by a Systems Requirements Specification.
?? Allocated Baseline represents allocations for system requirements into specific Configuration Items. This is normally a Procurement Specification or Development Specification.
?? Product Baseline defines the "as-built" and tested configuration and normally includes Engineering drawings; parts lists; product, Material and Process specifications, technical manuals, technical repair standards and verifications required to demonstrate required performance (test requirements).

5.2.2.5.6
System Manager Responsibility for Baselines

The Project Manager's Guide contained within this Manual may be used, as a guide to explain what an engineer and a System Manager needs to review or complete to fulfill the SMEF mission. The System Manager shall be responsible for maintaining the Product baseline. The SMEF shall:

- ?? Act as custodian of the engineering technical data which makes up the Configuration Baseline for each system equipment and/or software. This does not include the Provisioning documentation used to develop MICA, APL, etc.
- ?? Insure the accuracy of the Product Baseline Update the Product Baseline as configuration changes are approved and implemented.
- ?? Maintain the Product Baseline equipment and/or software. At periodic intervals, ensure the performance meets the technical specifications identified in the Configuration Baseline documentation.
- ?? Maintain a current copy of all Provisioning Documentation including master parts lists and APLs. Provisioning policies and procedures are provided in Provisioning Manual for Major Systems Acquisitions, COMDTINST M4423.1 (series).
- ?? Maintains a Software Master Library/Repository, which contains released software and documentation and pre-released software and documentation. Released software is software in the field that is supported by the SMEF. Pre-released software is software that is either under evaluation has not been delivered to the field. The Software Repository is an archive for inactive software and documentation, including updated masters. The Product Baseline for software is maintained in the Software Master Library/Repository.

NOTE:

Only the System Manager (i.e. as Configuration Manager) shall provide the Inventory Control Point (ICP) with approved changes to the Provisioning Technical Documentation.

5.2.2.5.7
What is Change Management?

Configuration Management is the Change Management agent in the systematic evaluation, coordination, approval or disapproval, and implementation of all approved changes to the configuration of a system, equipment, or software. Software is more susceptible to change than hardware, and each time software is changed it impacts the total system environment. The designated SMEF shall identify those processes and procedures necessary to accomplish change in a controlled logical fashion, beginning with the identification of methods to receive and handle system problem and enhancement notifications through the development and fielding cycles for modified systems.

5.2.2.5.8
Software Change Management

Software Change Management includes operation of a Software Library/Repository. The change management process not only controls changes but also sets change priorities and ensure prompt action. The Change Management process should be uniquely tailored for the system, equipment, or software assigned to the SMEF and documented in the Configuration Management Plan. The Configuration Management Plan shall be part of the preparation process needed to assume SMEF responsibility.

5.2.2.5.9
Sources of Change

Sources of proposed changes and examples of changes that require the Change Management process are:

- ?? Field units: System Trouble Reports (STRs), System Improvement Reports (SIRs), performance reports, system user reports, etc.; or visits to the field units
- ?? Commandant: Recommendations in technical reports, requests for evaluation, or directives.
- ?? Engineering activities: Recommendations made in technical reports; technical requests; suggestions, or informal contact.
- ?? Depot repair activities: Reports concerning reliability, maintainability, or repair costs.
- ?? Supply activities: Reports concerning logistics or support problem areas.
- ?? Training activities: Reports of problem areas or difficulties in associated training.
- ?? Manufacturers, contractors, or a commercial supplier of engineering changes, technical bulletins.

5.2.2.5.10 Local Configuration Control Board (LCCB)

The Local Configuration Control Board (LCCB) is the lowest level approving authority for configuration changes. LCCBs are chartered by the Commanding Officer at Headquarters Units and evaluate new requests for changes, evaluate project manager's proposals and approve or disapprove the change. They are authorized to approve Class II ECPs and to refer Class I, and those Class II when resources are insufficient to accomplish the ECP at the SMEF, to the Headquarters CCB for action. MLCs may delegate LCCB authority in writing to their ESUs. All Configuration Changes approved by the LCCB must comply with Headquarters' Configuration Control Board Policy. All LCCBs actions shall be recorded and available for CCB review.

5.2.2.5.11 Configuration Control Board (CCB)

The Configuration Control Board (CCB) is the foremost method of controlling the implementation of a product's changing configuration. The objectives of the CCB include:

?? Coordinate all releases, change reviews, and sign-off activity.
?? Give order and authority to the formal release procedure.
?? Assist in engineering by providing an orderly forum.
?? Provide assurance that all requirements have been met and current policies are being followed.
?? Maintain a record of all CCB transactions and attendance.
?? Classify changes as Class I or Class II.
?? Ensure that the total impact of a change is evaluated before the final implementation decision LCCBs and CCBs base their approval of an ECP on the following factors:
?? Need for the change, adequacy of justification
?? Cost-effectiveness
?? Funding availability
?? Effects on training installations
?? Impact of logistic support
?? Proposed installation schedule
?? Adequacy of the design and procurement documentation.

5.2.2.5.12 ECR Approval

A change to the Provisioning Technical Documentation shall be considered a change to the configuration baseline. For more information on the Provisioning Technical Documentation, see Chapter 5.2.8, MICA.

The SMEF shall be responsible for the engineering, management, and administration of configuration changes. This responsibility includes:

- ?? Developing implementation schedule and plans.
- ?? Coordinating with logistic and support elements.
- ?? Providing required technical documentation to appropriate procurement activities.
- ?? Providing technical direction and quality assurance of manufacturing or fabrication efforts.
- ?? Development and signature approval by the cognizant facility commanding officer of appropriate technical documentation for implementation of change, such as field change bulletins and software change notices.
- ?? Printing of required technical documentation and distribution.
- ?? Providing technical guidance to supply activities on distribution and development of appropriate support for the change.
- ?? Updating the master configuration baseline.

5.2.2.5.13 Configuration Status Accounting

The SMEF shall be responsible for documenting, recording, and reporting information on the configuration baseline; the history of changes to the baseline; the status of pending baseline changes; and implementation status information. The SMEF shall establish those processes and procedures to support recording efforts.

5.2.2.5.14 Monitoring of Field Configuration

The system manager/project manager for a system, equipment or software has responsibility for monitoring the installed configuration of that system, equipment, or software in the field. In performing this function the system manager shall:

Obtain information on the installed field configuration from various sources, such as:

1. Electronics Inventory Reporting (EIR) database queries. Specific requirements and schedules for this information will be coordinated between the cognizant facility and Commandant (G-S).
2. ESU/ESD inspection reports, both formal and informal, which may be submitted to the SMEF by district commanders, LORAN-C chain and regional managers, contractors, or Commandant (G-S).
3. Visits by SMEF technical personnel to field units to observe or compile data on the installed field configuration.
4. Visits by SMEF technical personnel as necessary to field units to observe that the installation of new SMEF equipment is according to the configuration baseline. Work with headquarters, maintenance logistic commands, ELC, district commanders and other headquarters units; solving problems associated with the SMEF assigned systems, equipment, or software.
   - ?? Monitor the status of the installed field configuration and determine differences between field installation and the configuration baseline.
   - ?? Provide direction and guidance to field units via the appropriate chain of command for correcting configuration differences and for keeping them advised as to the current status of the configuration baseline and pending change to the baseline.
   - ?? Report to Commandant (G-S) major problems or differences, which require commandant action for resolution.

5.2.2.5.15 MLC's role

MLC's shall assist the System Manager in ensuring units under their AOR are in compliance with the appropriate configuration. The System Manager shall apply configuration management practices to pre-release and released software. Reference (e) to provide additional guidance and policy. To ensure configuration control, the System Manager shall utilize a software master library and a software repository.

5.2.2.5.16 Software Master Library

The software master library maintains the master software files for CG developed or maintained software for electronics systems. The master library maintains all release/distribution records and supports the CCB or the SMEF's LCCB approval process.

5.2.2.5.17 Software Changes

Software change implementation, including distribution for CG maintained software, is managed from the master library. This includes preparing/issuing configuration status accounting reports and providing working copies of all software and documentation for software maintenance (CG maintained software).

5.2.2.5.18 Transfer of Material

When the software master library is inactive, all master media and documentation shall be transferred to the software repository.

5.2.2.5.19 Software Repository

The software repository provides program files and documentation copies to other programs. It also maintains a history log and a listing of all software in the repository. This includes a trouble log of all problems encountered while the software was active.

5.2.2.5.20 Sources of Information

The System Manager at the SMEF, as the life cycle manager, is responsible for monitoring the equipment or system's performance. The SMEF shall monitor the technical performance of equipment or computer software by reviewing technical and operational data/reports that are submitted to the SMEF. This shall include, but not be limited to, CASREPs, FLS reports, EIR queries, CMPlus queries, Allowance Change Requests and Stock Action Reports from the ELC.

5.2.2.5 Engineering Change Request, Continued

5.2.2.5.21 Electronics Support Review

The Electronics Support Review (ESR) is another vital source of operational information and shall be utilized. Further analysis is required for reports that identify potential problem areas. The SMEF shall compare actual field performance against specified technical performance standards and identify problem areas.

5.2.2.5.22 Suggestions from the user

Frequently, the end user determines a better method for configuration of a system or equipment. Everyone in the Coast Guard is encouraged to submit suggestions, via the chain of command using a System Improvement Request (SIR) form, to the System Manager at the SMEF or the ELC's platform manager, to improve the performance of the systems or realize efficiencies that may be overlooked or unknown.

5.2.2.5.23 Direct Liaison Authority

The SMEF's System Manager shall be technical liaison for the assigned SMEF equipment and software. The System Manager is authorized direct liaison with MLCs, ELC, district commanders, other headquarters units, commercial manufacturers and suppliers of electronic equipment or software for the purpose of exchanging technical information about equipment and software, or their applications.

5.2.2.5.24 Direct Interaction with units

MLCs and district commanders may authorize direct communications between the SMEF and units on a case-by-case basis. However, these authorizations for direct communications will not in any sense abrogate MLC or district responsibilities for support of its assigned units.
The technical liaison function could also include:

1. Coordination of certain engineering services to provide technical advice.
2. Advising headquarters acquisition managers with specification and proposal reviews and the drafting or review of proposed technical approaches.
3. Assisting the Inventory Control Point in managing the logistics support for the equipment.
4. Providing technical advice or assistance for assigned equipment to:
   - ?? The Depot Level Repair activities
   - ?? Project engineering activities
   - ?? Maintenance Logistic Commands (MLC)
   - ?? District and section offices
   - ?? Commercial manufacturers and suppliers as appropriate
   - ?? Other government agencies
   - ?? Training activities.
   - ?? Foreign governments as specifically authorized by the Commandant.

5.2.2.5.25 Dissemination of Technical Information

It may be necessary or useful for the System Manager to disseminate technical information to the field concerning support of the equipment or computer software for which they are responsible. This dissemination shall be through established directive and information media as follows:
All information of a directive nature shall be submitted to Commandant (G-S) for Promulgation under the Coast Guard directives system. OSC shall submit all information of a directive nature to Commandant (G-C).

5.2.2.5 Engineering Change Request, Continued

5.2.2.5.26 Directive Information

Technical information of a non-directive nature may be disseminated via the Electronic Systems Information Page (ESIP, available at http://cgweb.comdt.uscg.mil/g-sce/sce-2/) by submission to Commandant (G-SCE-2), or it may be disseminated directly using SMEF Advisory Notices.

5.2.2.5.27 Field Change Bulletins

Field Change Bulletins (FCB) document approved changes to a Configuration Baseline. The SMEF is responsible for the development of Field Change Bulletins. The cognizant facility commanding officer has final signature approval. The SMEF shall coordinate with the Equipment Manager for printing and distribution of the FCB. Guidance for preparation of FCBs is contained in Section 5.2.7.9.

5.2.2.5.28 SMEF Advisories

Software Change Notices (release notice) document approved changes to a Configuration Baseline. The SMEF is responsible for the development, printing, and distribution of Software Change Notices. The cognizant facility commanding officer shall have final approval authority.

SMEF advisories are used for rapid dissemination of directive and non-directive information. SMEF advisories will be followed by either directive or non-directive information or a field change bulletin.

5.2.2.5 Engineering Change Request, Continued

5.2.2.5.29 Reporting Requirements

Annually, the SMEF shall submit to Headquarters (Commandant (G-SCE)-2) a resource report covering all systems and equipment assigned. This report should arrive in Headquarters by August 15 of the current year. The report is used by headquarters to monitor the health of the electronics community, appropriate funding and personnel levels for equipment/systems assigned, leverage for pursuing additional resources and strategic planning. An outline of the reporting requirements follows: The title shall be itemized according to assigned equipment or system. For each item, the report shall list:

?? Hours expended by systems management personnel.
?? Hours expended by engineering personnel.
?? SMEF funds expended.

5.2.2.5.30 Activities Summary by Assigned System

The second part of the report shall address, by assigned system or equipment, configuration management performed. This should include:

?? Progress in acquiring data defining the Configuration Baseline. List actual and anticipated completion dates. Other data elements of the Configuration Baseline may also be commented on.
?? Configuration changes being processed.
?? Management problems requiring Headquarters assistance.

5.2.2.5.31 Equipment Manager Defined

Equipment managers have significantly fewer responsibilities then a systems manager or management team at the SMEF. An equipment manager is responsible for a particular piece of equipment, which does not have a significant interface with a system or is not considered mission critical. In many cases, an equipment manager will be providing life cycle support for commercial of the shelf (COTS) material, which requires little, or no, engineering expertise. Occasionally, in the execution of assigned duties, an equipment manager may be required to contract with an engineering facility, either a Coast Guard Center of Excellence (a SMEF) or an outside contractor, to resolve an engineering issue beyond their capabilities.

5.2.2.5 Engineering Change Request, Continued

5.2.2.5.32 Assignment	Any support unit may be assigned as an equipment manager. Assignment shall be in writing from Commandant (G-SCE). Additional resources are usually not associated with equipment manager assignment.
5.2.2.5.33 Commanding Officer's Responsibility	Commanding Officers of units assigned and/or performing equipment manager functions for electronic equipment, or for a computer software product, shall perform the life cycle duties for their assigned electronic systems, equipment, or computer software as directed by Commandant (G-SCE).
5.2.2.5.34 Technical liaison with other units	To facilitate efficient communications for life cycle management, the equipment manager, via the chain of command, is authorized to establish technical liaison with Maintenance Logistic Commands, the Engineering Logistics Center, and, within the equipment manager's jurisdiction, the district's operational field units. Requests for casualty support shall utilize the appropriate support chain of command, including the Electronics Support Unit or Maintenance and Logistics Command.
5.2.2.5.35 EILSP Authority	If an Equipment/System Integrated Logistics Support Plan (EILSP) exists, the equipment manager shall assume ownership of the EILSP and maintain the document for the life of the equipment. For legacy equipment, without an existing EILSP, the equipment manager shall create an EILSP.

5.2.2.5.36 Performance Monitoring

The equipment manager is responsible for monitoring the equipment's performance. This can be done through various means and requires aggressive data mining and information resources. The equipment manager shall monitor the technical performance of equipment or computer software by reviewing technical and operational data/reports as available. The equipment manager shall also compare actual field performance against specified technical performance standards to identify problem areas. Where problems (which are outside the scope of the equipment manager's ability to correct) are indicated, the equipment manager shall contact Commandant (G-SCE) for assistance.

5.2.3 Project Management Guide

5.2.3.0.1 Overview

Currently, there is no requirement for a new Project Manager (PM) to attend a standardized PM class. Although there are many references available for the new PM, the PM must know where to look to find these references. If the new PM has not been involved with project management previously, the PM may not know which questions to ask. This guide, although contained within the Electronics Manual, is intended to be used as a guide and establish a standard for all electronics projects to be modeled after.

New PM s-are advised to get copies of all the references and familiarize themselves with their contents. In these references are the requirements of the PM's job. This section will assist the PM in understanding how to use the references and when to be concerned with deliverables. Not every topic discussed within this section will apply to every project. The PM should use common sense. Creating a document that adds no value is a waste of time and effort for the PM and the elements that are required to provide concurrent clearance approval.

PMs will be closely involved in all phases of the project life cycle. It is important that the PM has a good understanding of the big picture of the project process from start to finish. Projects can be broken into several distinct phases: initiating, planning, executing, and closing.

5.2.3.0.2 Project Manager Confusion

The Project Manager’s duties as defined in this section should not be confused with the Project Manager of a Major Acquisition, as defined by the Major Systems Acquisition Manual, M4150.2 (series). As stated above, Project Manager’s in this Manual are involved in all phases of the project life-cycle for electronics equipment.

5.2.3.0.2 Contents

This section contains the following topics:

Back to Table of Contents

5.2.3.1 Project Process

5.2.3.1.1 Controlling the Project

The PM must always be in "control" of the project, not visa versa. The following elements make up project control:

Use the "Critical Path" or "Critical Chain" methods of project control. The critical path method of control focuses on the longest path of dependent tasks, whereas the critical chain method focuses on saving as much "buffer" time as possible and pushes it to the end of the project to account for certain task delays. The Program Manager shall be responsible for:

?? Constantly monitor task completion.
?? Re-assign project tasks as needed.
?? Re-evaluate project resources and schedule as needed with the customer, re-evaluate project requirements as needed.
?? Get help if needed EARLY in the project cycle.

5.2.3.1.2 Project Management Software

The PM should utilize one of the Coast Guard's standard project management software applications to track tasks required and time remaining to the next deadline. There are many advantages to using a dedicated project-management software package rather then a spreadsheet or word processing document. Dedicated software will impose a methodology and ensure commonality among unit PMs and the Coast Guard support infrastructure.

Dedicated software also provides a logical planning structure;

?? A numbering of the work breakdown structure in a system-generated sequential,
?? Resource-based format;
?? A listing of constraints;
?? Multiple views of the project; and
?? Automated formatting of reports.

Data entered become relational and can be reformatted to various chart types, queried against, sorted, etc. The PM will require minimal time to set up a basic Gantt chart, versus entering the task data in a word processor. The software usually permits timely updates and -"what-if" scenarios.

5.2.3.1.3 Project Initiation: Sources of Projects

Projects come from many varied sources including;

- ?? Congressional mandate,
- ?? The Chief of Staff,
- ?? The Assistant Commandant for Operations (G-O),
- ?? The Assistant Commandant for Systems (G-S) or
- ?? Field units and
- ?? Other commands.

A project can take the form of;

- ?? Crisis Contingency Projects (CCP),
- ?? Engineering Change Proposals (ECP)
- ?? Engineering Change Orders (ECO), and
- ?? Single year or multi-year projects.

Senior members of the command will work closely with the project initiators to determine;

- ?? Project goals and objectives,
- ?? High-level requirements,
- ?? Project customer(s),
- ?? Project execution strategies,
- ?? Gross project resources (personnel and financial),
- ?? Project priority,
- ?? Project negotiation strategies,
- ?? If necessary, and finally assignment of a PM.

5.2.3.1.4
After the PM is assigned

Once the PM is assigned, senior leadership at the command and the PM will conduct risk management planning and preparation. Most decisions made during the management of an acquisition involve some degree of risk. Risk management concentrates on identifying and controlling areas or events that will result in breaching project cost, schedule, or technical performance parameters in the Acquisition Project Baseline (APB). Risk Management Planning is an integral part of the overall success of an acquisition and includes a structured approach to APB management. The PM must identify and assess potential impediments to achieving project objectives. Proper risk management requires a systematic approach to the identification, analysis and handling of risk, and the use of effective documentation, data collection, assessment, data quantification, trend analysis and reporting techniques. DoD 4245.7-M, Transition From Development to Production, and DSMC Publication, Risk Management.

5.2.3.1.5
Project Planning

A properly planned project is one "designed for success-." Poor planning will almost certainly cause a project to be delayed, run over budget, or be cancelled altogether. Given the current climate of limited resources and our roles as efficient stewards of the Taxpayers 'dollars, efficient use of resources means delivering quality products and services at a minimum total cost. This cost includes both dollars and labor resources required to provide support with minimal rework or waste. The object for the PM is to maximize use of scarce resources and ensure that adequate funding is in place to meet support needs. A properly planned project should facilitate this objective.

5.2.3.1.6
SMEF/EM Assignment

Unless the equipment is a replacement for an existing system or equipment, a manager must be assigned by Commandant (G-SCE). See section 5.2.2.1.10

5.2.3.1.7
Training

The PM must take a "big picture" look of the project to determine potential shortfalls in knowledge of the project team. Once the shortfalls have been identified, the PM should endeavor to obtain the training, whether by sending the students to the classes or bringing the instructor to the unit.

5.2.3.1.8
Inter-Agency Agreements

Frequently a project undertaken by the Coast Guard affects operations outside - U.S. Coast Guard control. Agreements with the FAA, the FCC, Navy, international agreements with Canada and various Caribbean countries, etc., must be considered when a PM makes recommendations or decisions. The PM must make every effort to review applicable interagency agreements and MIPRS. There are several issues the PM must consider when reviewing the interagency agreements: ownership of the equipment, maintenance of the equipment, operation of the equipment, who will purchase and who will pay for the equipment. Although the Coast Guard may not always pay for the additional equipment, we must at least consider the possibilities.

5.2.3.1.9
Joint Requirements Planning (JRP) / Joint Application Development (JAD) Session

Where applicable, the PM may consider hosting a JRP or JAD session. The terms JRP and JAD can be used interchangeably. JAD is better suited for development of software, whereas JRP is better suited for system/hardware design. The JRP/JAD is a tool used by PMs who need to make decisions affecting multiple areas of an organization. The one or two day JRP/JAD session should occur prior to the development of the Operational Requirements Document (ORD). Representatives from all involved organizations need to be present and ready to make decisions. The preliminary objectives, strategy, resources, and roles for the project are determined. This leads directly into development of the ORD.

Due to scheduling and operational constraints, it is not always possible to convene a formal JRP/JAD session. The information necessary for development of the ORD can be obtained through other communications channels, such as telephone, e-mail, message, or correspondence. It is critical to ensure thorough coverage of all aspects of the project, as would be done in the formal JRP/JAD.

5.2.3.1.10 Project Requirements - Operational

All projects begin with documented authorized requirement sets. Upon assignment as a Project Officer, the Project Officer receives from the Program Manager requirements generated for the Project. The requirements may be in the form of an Operational Requirements Document (ORD) or a less formal form of documentation. The requirements establish the minimum acceptable standards of performance (thresholds) and optimum performance objectives (goals) for the system and sets goals to define an operationally effective system. The Project Officer, as needed, shall assist the Sponsor's Representative in further defining the operational and support requirements for the system. These more detailed requirements/specifications shall be captured in a method identified by the SMEF. At a minimum, they shall be in word documents, from which appropriate guidance regarding the system development may be traced. All requirements must be testable in order to evaluate the system's operational capability. In the case of legacy systems, the Project Officer may discover that updating of the requirements requires changes to the existing configuration. Any proposed changes in the performance, safety, or reliability, availability, and maintainability requirements of the systems require approval from either the Configuration Control Board (CCB) and/or Local Configuration Control Board (LCCB). Therefore, the CCBs are an integral part of the review and approval process for requirement updates. L/CCBs shall review the requirements through the change cycle process and authorize them to be released for action. No actions shall be taken without formal presentation, review and release of the authorized change (ECP) through the standing control board.

5.2.3.1.10.1 Project Requirements - Technical

Ultimately, the Project Officer must transform the operational requirements into technical (specification) requirements. In doing so, system effectiveness shall guide the Project Officer in making decisions about technical specifications. System effectiveness requires the Project Officer to address two important parameters; performance and support. Two aspects of performance include capability and utilization.

In determining technical specifications in relation to capabilities, the Project Officer should specify only those functions, modes, and characteristics, which are necessary to meet the operational requirements. In respect to utilization, the Project Officer should specify environments that realistically reflect the actual usage environment. For example, the requirement for ruggedized equipment may be necessary for shipboard use and the additional cost justified, however in a shore installation, the requirement may not apply and thus not economically justified. MIL-HDBK-2036, Preparation of Electronic Equipment Specifications provides guidance to Project Officers for the development of requirements for end-item specifications and commercial item descriptions. MIL-HDBK-2036 also provides guidance for the evaluation of commercial-off-the-shelf (COTS) equipment and Non-Developmental Items (NDI) as to their suitability for use in military environments.

The second parameter of system effectiveness the Project Officer must address is supportability. Supportability is the probability that all the elements necessary to affect the repair of an item will be available within a specified time. Two aspects of supportability; availability and dependability, are primary concerns in supportability design. Underlying availability and dependability are the concepts of reliability, maintainability, downtime, and the measures associated with each. The usual measures of reliability and maintainability are Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR).

5.2.3.1.10.2 Requirements - Meeting Operational Availability

The Program Manager may specify that the system or equipment must meet a certain Operational Availability (Ao). Ao is the probability that a system or equipment, when used under stated conditions in an actual operational environment will operate satisfactorily when called upon.
Ao is expressed as

Ao = MTBM/ MTBM + MDT

Where MTBM is the mean time between maintenance, which includes both preventative (scheduled) and corrective (unscheduled) maintenance requirements. MDT is the mean maintenance downtime, which is the total time during which a system or equipment is not in condition to perform its intended function. MDT not only includes active maintenance time, but also logistics delay time which is the downtime that is expended as a result of waiting for a spare part to become available.

5.2.3.1.10.3 Requirements - Standardization

As the Project Officer begins to identify systems and/or equipment to meet the specifications derived from the requirements, the need to address the concept of standardization arises. The program manager must balance the decision to standardize against specific mission requirements, technology growth, and cost effectiveness. Standardization provides for lower life cycle costs associated with maintenance, repair, and operation of resources. Increased populations of standardized items promote economies of scale and increased supportability over the item's service life. Standardization considerations for the Project Officer include analyzing equipment that already has a population within the Coast Guard or other DoD agency and already supported in a government inventory.

Continued on next page

5.2.3.1.10.3 Requirements – Standardization, Continued

By identifying equipment or parts managed by other agencies, the Coast Guard avoids administrative and operational costs involved in developing, testing, and maintaining the equipment or parts. For example, the requirements state the need for a ruggedized, tactical computer for shipboard use. In addition, interoperability, compatibility and integration are key standardization goals that must be satisfactorily addressed for all acquisitions.

Navy support for the equipment may include logistics support in the form of parts control and management at the Navy Inventory Control Point (NAVICP), Allowance Parts Lists (APL), technical and/or operator manuals, Planned Maintenance System (PMS) procedures, and training. The decision to standardize saves the Project Officer time and effort and the Coast Guard valuable resources because the Navy has already expended the effort and resources to establish a support and maintenance structure for the tactical computer.

5.2.3.2 Cost Benefit and Risk Management

5.2.3.2.1 Overview

The PM must complete a Cost Benefit Analysis (CBA) in order to look at all alternative solutions to a problem and choose the most appropriate solution based on technical, political, managerial, resource, and cost considerations. The CBA is sometimes done informally, when the solution is dictated or obvious-; however, it is still necessary to consider all alternatives before discarding them. The cost benefit analysis will evaluate acquisition, installation, initial issue spares, depot stock, SMEF or equipment manager, lifecycle support, and disposition costs over a 7-year life cycle at a minimum.

5.2.3.2.2 Risk Management Concepts

Risk management a program manager's responsibility can be a comprehensive and responsive management tool if it is properly organized and monitored at the PM level. A formalized risk management program should be well planned and forward-looking by identifying, analyzing, and resolving potential problem areas before they occur, and by incorporating monitoring techniques that accurately portray the status of risks and the efforts to mitigate them. Introduction of risk management early in a program emphasizes its importance and encourages contractors and members of the Government team to consider risk in the daily management functions.

5.2.3.2.3 What is Risk?

A risk is any factor that may potentially interfere with successful completion of the project. A risk is not a problem - a problem has already occurred; a risk is the recognition that a problem might occur. By recognizing potential problems, the PM can attempt to avoid a problem through proper actions.

5.2.3.2.4 Programmatic Risk

Programmatic risk is made up of those risks which include resources and activities which may be outside the project's and PM's control, but which can affect the project's direction and success. Programmatic risk is usually due to external factors and refers to the top-level considerations, which must be given to the entire acquisition project. Examples of programmatic risk include:

?? Support issues,
?? Political concerns,
?? Funding constraints,
?? Organizational problems,
?? Corporate business risks, etc.

Programmatic risk is measured in terms of cost and schedule impact.

5.2.3.2.5 Supportability Risk

Supportability risk is the risk associated with fielding and maintaining systems, which are currently being developed (or selected) or have been developed and are being deployed. Supportability risk is comprised of both technical and programmatic aspects. The ten ILS elements present potential sources of risk. For instance, a particular piece of support equipment may pose a technical challenge and have significant supportability implications. Training, which is generally a programmatic risk, can quickly become a major supportability risk when maintenance and operations support become the driving factors.

5.2.3.2.6 Risk Drivers/ Risk indicators

In general, risk drivers are the technical, programmatic and supportability elements of risk while the cost and schedule elements are risk indicators. Project Managers must achieve a balance between the five risk elements to reach cost, schedule and technical performance goals.

5.2.3.2.7 Risk Classification

In general, the greater the probability of occurrence and the greater the severity of consequence to the project, the greater the degree or level of risk classification assigned to the effort. There are three classifications of risk that will be used by acquisition projects:

?? Something likely to cause significant, serious schedule disruptions, increase cost, or increase requirements or degrade performance, even with stringent, special attention and monitoring.

?? Something likely to cause some disruptions in schedule, increase in cost, or degradation in performance. Special attention and monitoring can probably overcome the difficulties.

?? Something likely to have little potential for causing disruptions in schedule, increase in cost, or degradation in performance. Normal attention and monitoring can probably overcome any potentially difficult effects.

5.2.3.2.8
Cost Risk Analysis

To minimize the probability of cost growth, Sponsors' Representatives and PMs must understand the cost analysis techniques used during different phases of the acquisition process.

5.2.3.2.9
Schedule Risk Analysis

The effective use of schedule analysis techniques is imperative to identify and control project schedule risk. Several analytical and simulation techniques are available for use with schedule networks to estimate the probability that the total effort represented by the network will be completed when expected.

5.2.3.2.10
Technical Risk Analysis

System development (or selection) technical risks can include:

?? Not meeting safety or performance requirements such as maneuverability, sustainability or speed;
?? Design concepts that prove unsuitable;
?? State-of-the-art or state-of-the-market equipment that do not meet expectations; or
?? Tailored software packages that do not perform.

Production risks often involve material lead-time projections, and availability or manufacturing processes. Sustainability risk may include;

?? Reliability,
?? Maintainability,
?? Operational readiness (or availability), and
?? Overall system operability, interoperability and supportability.

Methods available to identify and manage technical performance risk include systems engineering management (or market research and surveys of NDI and COTS items), technical specification/documentation and review, decision analysis models, trade-off analyses, and technical performance measuring (TPM) planning and analysis.

5.2.3.2.11 PM's Responsibility for Risk Management

The PM is responsible for the overall conduct of risk management for the acquisition project. The PM will ensure that all project personnel and applicable support matrices address risk management. PM responsibilities include the following:

- Ensure that all project personnel and applicable support matrix personnel address risk management. Ensure that risk discussions are part of all project management technical, support and business reviews.
- Coordinate with the Sponsor's Representative and the Contracting Officer to ensure that risk management is addressed in the Acquisition Plan.
- Coordinate with Support Program Managers for increased operational awareness of and participation in acquisition risk management efforts in order to facilitate improved transition of effective and suitable systems from acquisition to operations.

5.2.3.2.12 Risk Management Plan

The Risk Management Plan (RMP) documents the procedures used to manage risk throughout the project. In addition to documenting the results of the risk identification and analysis phases, it must cover;

- Who is responsible for managing various areas of risk;
- How risks will be tracked throughout the life cycle;
- How contingency plans will be implemented; and
- How project resources will be allocated to handle risk.

The three primary elements of risk to be addressed are the cost, schedule, and technical performance parameters established in the Acquisition Project Baseline (APB). The PM is responsible for preparation of the RMP.

5.2.3.2.13 Milestone Defined

A milestone is a significant point in development. When defining milestones for a project, don't forget the word significant. Don't make the end of all tasks a milestone. Instead, choose those tasks in the schedule where something truly significant should have been completed. This is often a point where a decision must be made - for example, continue, re-plan, or get more resources. Further, base each milestone on something measurable; otherwise, you won't know when you get there. Milestones can be arranged either sequentially or in priority sequence.

5.2.3.2.14 Project Schedule

The PM needs to plan the schedule to ensure timely completion of the project. Consideration must be given to lead time for purchase of parts and equipment, when projects funds are available and expire, holidays, personnel availability, conflict with other projects, weather, travel requirements, training needs, special events, etc.

5.2.3.2.15 Resources Estimates

The PM needs to look at requirements for personnel and funding. A shortfall in either area needs to be identified to the PM's Chain of Command as soon as possible to keep the project on schedule. The PM may look for assistance from other Branches and Divisions. Personnel may be temporarily assigned to projects in other Branches and Divisions at the discretion of the PM's chain of command. The PM, via the PM's Chain of Command, is encouraged to contact appropriate staff at the Naval Post-Graduate School, the Coast Guard Academy, or the Research and Development Center. It may be possible to pass the prototype development phase of the project on to them. Details are worked out at the PM level, and then sent up the Chain for approval.

5.2.3.3 Funds Management

5.2.3.3.1 Overview

The Funds Management Division coordinates, oversees, and manages the Commandant (G-S) budget build process and the budget execution, tracking obligations, transfers, expenditures, and reconciliation. Administrative operating targets are broken down into sub-targets called Allotment Fund Control (AFC) Codes for the Operating Expenses (OE) and RT appropriations. Allotment Fund Control (AFC) Codes represent a breakdown of OE and RT administrative operating targets (AOT) for specified purposes. Some AFC codes, which may pertain to electronics, are:

5.2.3.3.1.1 List of Funds

AFC-30	Operating and Maintenance. General operating and maintenance expenses.
AFC-40	Chief of Staff Administrative. Funds for transfer to other control accounts for projects or expenses approved by the Chief of Staff.
AFC-41	Aeronautical Engineering. Depot level maintenance expenses incurred in the aviation program.
AFC-43	Civil Engineering. Depot level maintenance expenses incurred in the shore unit program. AFC-45 - Naval Engineering. Depot level maintenance expenses related to inventory, repair, alteration, modification, and engineering design services in support of naval engineering.(This is separate from AFC 43
AFC-54	Ordnance. General expenses associated with ammunition and small arms.
AFC-56	Training. Formal training performed as TAD for civilian and military personnel, including Reserve members in the RK, RP and RY programs, and Auxiliarists.
AFC-80	Reimbursable. General expenses related to the commodities, work, or services furnished to another government agency, Coast Guard appropriation, individual, firm, or corporation when, law may credit the reimbursement credited to the Operating Expenses appropriation.

Continued on next page

5.2.3.3.1.1 List of Funds, Continued

AFC-42	The Allotment Fund Control Code (AFC) 42 is for the procurement, replacement, installation, major maintenance and system support of standard electronic navigation, sensors, command and control (C2), and communications systems. These systems are deployed on Coast Guard cutters, boats, and shore facilities and support all Coast Guard missions. The Financial Resources Management Manual, COMDTINST M7100.3 (series) specifically lists the allowable and not allowed expenses for AFC 42. In summary, AFC 42 funds may be used for; ?? Procurement, ?? Replacement, ?? Installation, ?? Major maintenance, and ?? System support of supported electronic equipment. This includes installed cabling that is an integral part of the system. This does not include antennas for Morale, Welfare, and Recreation purposes, such as television satellite dish antennas.

5.2.3.3.2 AFC-42 Major Maintenance Definition

Major Maintenance includes intermediate- level and depot-level maintenance, overhauls, and other maintenance that exceeds unit capability.

5.2.3.3.3 AFC-42 Minor Maintenance Definition

Minor maintenance includes organization- level maintenance, including CG PMS and casualty response within the unit's capability.

5.2.3.3.4 AFC-42 Cabling Definition

Cabling includes signal-carrying twisted- pair wires, coaxial cable, fiber-optic cable, wave-guides and power cables to equipment racks from power panels.

Policies and procedures for the planning, requesting and administration of Navy AFC-30 and AFC-42 funds are contained in Support of Navy-Type, Navy-Owned Electronics Equipment, COMDTINST M7100.2 (series).

5.2.3.4 Acquisition Plan

5.2.3.4.1 Overview

Procurement documentation varies widely based on the type of procurement. This section only touches the surface on some of the documentation required. An excellent source of information on procurement requirements is the U.S. Coast Guard Headquarters Customer Acquisition Handbook for Non-Major Systems. EDIV and ADIV can also provide assistance on requirements for specific purchases. Procurement documentation discussed below corresponds to Non-Major System Acquisitions only.

5.2.3.4.2 Acquisition Plan (AP)

The Acquisition Plan is a formal decision document, which is based on and refines the acquisition strategy objectives of the approved Mission Needs Statement (MNS). The AP also updates and expands on the information provided in the initial proposal, and describes the project's plans for primary and support procurements, inter-agency agreements, and competition and source selection.

5.2.3.4.3 AP Requirements

APs are required for all levels of major acquisitions (over $5M) by the Federal Acquisition Regulation (FAR), Part 7, and the Major Acquisition Policy and Procedures (MAPP). The project’s designated Contracting Officer (KO) prepares the AP for the PM.

5.2.3.4.4 AP Input

A streamlined approach should be used. The AP should identify the areas of streamlining appropriate to the acquisition. Streamlining techniques include, but are not limited to the following: sending out draft specifications, SOWs, and RFPs to industry for comment; limiting the size of proposals and the number of people on evaluation teams; and using performance based specifications. All streamlining efforts are aimed at ensuring that procurements are awarded in an efficient and expeditious manner.

The Major Systems Acquisition Manual, COMDTINST M4150.2 (series), although intended for major purchases, offers excellent guidance for the PM.

5.2.3.4.5 Specification/ Statement of Work (SOW)	A Specification/Statement of Work (SOW) is required when purchasing supplies and services. A specification details the technical/functional requirements when purchasing supplies (a system, components of a system, etc.). A SOW details requirements for a service-type contract. Be very specific in describing deliverables and dates when preparing the Specification/SOW.
5.2.3.4.6 Independent Government Cost Estimate (ICGE)	Comparing quotes received with an IGCE is one method for determining a proposed price to be fair and reasonable and shall be included in every procurement package sent to G-ACS. When utilizing this price analysis technique, the prices must bear a reasonable relationship to each other. If the price variance between responses reflects a lack of adequate competition, some other form of price analysis must be used to determine the price fair and reasonable. When procuring an item(s) that has not been selected as a result of a full and open competition, a JOTFOC shall be included in the procurement package. The reason(s) for not conducting a full and open competition process, including brand name requirements, distance to the facility or any other reason, must be documented. This also applies to sole source procurements.
5.2.3.4.7 Justification for Other Than Full and Open Competition (JOTFOC)	COTS/NDI, a widely used acquisition consideration for the Coast Guard, can require special planning. The use of COTS/NDI equipment provides cost effective, readily available items that usually have established support and distribution systems. Usually the COTS/NDI process is a quicker acquisition method, though the PM must realize the support schedule and follow on costs are dictated by the commercial source.
5.2.3.4.8 Commercial Off the Shelf and Non-Developmental items (COTS/NDI)	COTS/NDI items should be considered if a product meets the requirements of the PM. The PM should note that frequently technical data, data rights, and configuration management are not available with COTS/NDI components. This could lead to subsequent difficulties with support or skyrocketing support costs.

5.2.3.5 Parts of Project Planning

5.2.3.5.1 Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) provides a framework for specifying the objectives of a project. It defines the project in terms of hierarchically related product-oriented elements. Each element provides logical summary points for assessing technical accomplishments and for measuring cost and schedule performance. Some of the benefits of using a WBS during the life of a project include:

?? Separates a system into its component parts, making the relationships of the parts clear and the relationship of the tasks to be completed-to each other and to the end product-clear.

?? Significantly affects planning and the assignment of management and technical responsibilities.

?? Assists in tracking the status of engineering efforts, resource allocations, cost estimates, expenditures, and cost and technical performance.

?? Helps ensure that contractors are not unnecessarily constrained in meeting item requirements.

The Project Officer develops the project WBS in the conceptual stages of the project and is responsible for maintaining the WBS as it develops through systems engineering and management planning processes. MIL-HDBK-881; Work Breakdown Structure presents guidelines for preparing, understanding, and presenting a WBS.

5.2.3.5.2 Quarterly Progress Reports (QPR)

Quarterly Progress Reports (QPRs) are one of the tools for the PM to ensure the contractor/vendor is completing the contract as specified. The PM should review with the contractor what has been completed since the last QPR, any difficulties encountered, measures and any pertinent funding issues. There is no formal format for a QPR. The PM's command will provide additional guidance.

5.2.3.5.3 Prototypes	A prototype is a full scale installation to evaluate the usefulness and effectiveness of an Engineering Change and/or develop or modify installation specifications.
5.2.3.5.4 Prototype Development	Whenever possible, it is highly desirable to quickly produce prototypes to present to the customer(s). Prototyping is a good idea whenever a system is being put together. This gives the customer(s) a feel for what the system may look like, how it interfaces with existing equipment, and what functionality will be provided.
5.2.3.5.5 Test Equipment Allowance List (TEAL) Changes	The PM must identify any new test equipment required at the field unit or old test equipment no longer needed due to the project. PM will work with both MLCs to update the TEAL. Test equipment is also discussed in section 5.2.9 of this Manual.
5.2.3.5.6 Preliminary Design Review (PDR)	The Preliminary Design Review (PDR) is used to ensure the design approach satisfies the System specification requirements. A product of the PDR is the establishment of the Allocated Baseline. The PM is responsible for the PDR, which is typically attended by all engineers and technicians.
5.2.3.5.7 Critical Design Review (CDR)	The Critical Design Review (CDR) is used for reasons similar to the PDR. The CDR is used to ensure that the production design satisfies the requirements set out ion the specifications. The product of the CDR is the establishment of a Product Baseline. The PM presents the current system design(s), Laboratory Test results, and the status of the Field Test. In addition, detailed plans for the final-form installation are provided, including final system drawings and documentation.

5.2.3.6 Shipping and Foreign Travel

5.2.3.6.1 Hazardous Materials	Arrangements for foreign travel and shipping should be looked at early in the project. Coordination with foreign agencies and Customs may take longer than anticipated. Also, a non-HAZMAT item in the United States may be considered HAZMAT by another foreign agency. Shipping regulations are contained in Transportation of Freight, COMDTINST M4610.5 (series); refer to the Code of Federal Regulations (CFR), Title 49, Transportation, Parts 100-199.
5.2.3.6.2 Transportation of Technology	The PM must also be aware that the transportation of technology out of the United States, including demilitarization of electronics, must be addressed. If any material is to be shipped outside of the United States, the PM should seek additional guidance from the Commandant (G-SLP).
5.2.3.6.3 Foreign Travel Instructions	IAW Foreign Travel, COMDTINST M5000.5(series) travel outside the U.S has special procedures that must be followed. The PM should consult this instruction if there is any possibility of foreign travel since the instruction requires advanced notification from travelers.

5.2.3.7 In-house and Field Testing

5.2.3.7.1 In-house Testing

The purpose of in-house, or laboratory, testing is to ensure the project will not cause any interference or other problems which may affect current system operations, as well as testing to ensure the equipment does what it is designed to do. A project, which interacts with an existing system, is never fielded without an in-house test. The test may be performed at the PM's command, or another Coast Guard engineering center of excellence. The PM is responsible for development of the Laboratory Test Plan. The Test Plan is specific to the project, but will include, at a minimum, the objective of the test, the specific tasks involved in the test, and the criteria for successful completion of the test.

5.2.3.7.2 Field Testing

A Field Test is always a major part of any project. The tests will check all aspects of the configuration, even if not directly impacted by the new or modified system component(s). A Field Test will normally last at least 30 calendar days. In addition to equipment testing, draft documentation developed will be checked and corrected as necessary. This includes;

- ?? Installation Plans,
- ?? Test Plans,
- ?? Engineering Certification Checklists,
- ?? Field Changes,
- ?? The System Operator's Guides,
- ?? Technical manuals and
- ?? System drawing edits.

5.2.3.7.3 Purpose of the Pre-certification

Completion of the pre-certification of existing systems/equipment it is interfaced with is extremely important to any installation. This ensures the system is operating within normal parameters PRIOR to the installation or modification of equipment. Without completing a pre-certification, troubleshooting becomes an enormous task.

5.2.3.7.4 Equipment of System Installations

An installation team/activity or unit personnel perform an "Installation", IAW an approved Field Change or Engineering Change. The PM has many things to consider if a team is being sent into the field to install equipment. There are travel logistics, equipment staging, shipping, AUTM requests, pre-site evaluations, and post-installation considerations. COs and unit CO/OICs should be given as much lead-time as possible prior to an installation. Typically, a "readiness alert" should be provided at least 3 months in advance of the install. This will allow unit personnel to prepare for the installation, and hopefully, make the pre-certification of the station equipment go quickly. A pre-site survey evaluation may be a good idea for larger, more complex installations where unique station configurations could cause problems. A second SMEF advisory is required following the installation. SMEF's shall create a method of evaluating systems throughout the development cycle, culminating with final acceptance testing prior to fielding the product. Levels of engineering testing and evaluation shall be documented and final testing shall deliver a full record of methods used to test. If all testing and documentation were properly prepared up to this point in the project cycle, the installation should go smoothly...but remember, ***ALWAYS PLAN FOR THE WORST***!

5.2.3.8 PM's Relationship with ELC and TRACEN

5.2.3.8.1 Depot/ Pipeline Sparing

The PM and the ELC are responsible for determining the level of sparing necessary for the fielded equipment. This is typically 10 percent of the total number of fielded equipment, although it can differ. Spares are purchased with project funds in quantities IAW the EILSP and must arrive at ELC in sufficient time to enter the ELC's inventory and to be advertised in the ELC Electronic Equipment Support Gram.

5.2.3.8.2 Support Grams

The Electronic Equipment and Coast Guard Standard Workstation II (SWII) Support Gram, formerly ELCINST 4408.1, is a catalog of all electronic equipment and associated repair parts, both reparable and consumable, that are currently managed by the ELC. Open communication between the PM and ELC personnel is key in ensuring that all new equipment and systems are included in the support gram. ELC will not advertise the availability of any part until adequate funds or sufficient spares are donated by the PM to support the fielded population. The quantity of donated spares should have been previously agreed upon and addressed in the approved equipment EILSP. As soon as the support infrastructure is in place and spares are received, the equipment will be included in the support gram and advertised to the fleet. The Electronic Equipment and Coast Guard Standard Workstation III (SWIII) Support Gram can be accessed on ELC's Intranet website at http://cgweb.elcbalt.uscg.mil/docs/sptgram/Index.htm.

5.2.3.8.3 Planned Maintenance System (PMS)

The PM will identify any new or changed PMS requirements generated by the project and provide them to Engineering Logistics Center, Platform Management Division COTR. The ELC COTR and CGPMS Contractors will add the changes to the Candidate Equipment List, make additions/ deletions/ modifications to the PMS procedures, update PMS cards as necessary, and distribute them to the field. If required, the ELC will coordinate with the SMEF to initiate a SMEF advisory to the field. CGPMS is discussed in section 5.2.6.2 of this Manual.

5.2.3.8 PM's Relationship with ELC and TRACEN, Continued

5.2.3.8.4 Baseline Upgrades

When required, the PM will plan for baseline upgrades at TRACEN to ensure their configuration is identical to field units. The PM should be prepared for more detailed questions or explanations, since TRACEN will have to train personnel on the changes. The ET Force Manager should also be notified as soon as practical to include the new equipment in the following years planning and budget models.

5.2.3.8.5 Training

Organizational, Depot, SMEF and TRACEN Training. The PM is responsible for ensuring all levels of training are planned for and carried out.

5.2.3.9 Property Records

5.2.3.9.1 Project Records	The PM is responsible for maintaining records of equipment acquired during the course of the project for at least 5 years. At completion of the project, the PM must identify any project property that will be retained on board. Any HAZMAT items should be flagged. The PM will notify the Property Officer to ensure the property records are appropriately amended.
5.2.3.9.2 Follow-on Support	Following project closure, the PM will gather all pertinent documentation for the project, appropriately identify and label it, and ensure it is properly archived. The PM is required to back-up all electronic documentation to the appropriate media and store it in the archives with other project documentation.
5.2.3.9.3 Customer Satisfaction Surveys	Upon project closure, the PM may distribute Customer Satisfaction Surveys to all affected units. Results of these surveys may be used to improve internal Project Management techniques and processes.

5.2.3.10 Project Documentation and Plans

5.2.3.10.1 Draft Documentation

With the rapid change of technology and the installation of new systems, it is critical that adequate support resources (personnel and financial) are available and in place prior to deployment of systems. In addition, policies and procedures must match resources available and promote efficient and effective support guidance. Upon completion of all required actions, the PM will prepare a Final Report. This letter report will provide details of what was accomplished, total funds spent, major obstacles encountered, possible follow-on work or outstanding action items, and follow-on support information. The final report should delineate an official transfer of support from the project to the support activity IAW the EILSP. The report will typically be distributed similar to the EILSP, but will also include appropriate field units.

5.2.3.10.2 Proper Documentation

Properly documenting the project cycle is vital to project success and customer satisfaction. No project is ever fielded or completed unless it is fully documented. Although documentation requirements are quite extensive, this section was designed to help the PM complete each required document. Draft documentation should be completed prior to any field-testing to provide copies to field personnel.

5.2.3.10.3 Final Documentation

Final documentation must be completed prior to any final-form field installations in order to provide copies to field personnel.

5.2.3.10.4 Operational Requirements Documentation (ORD)

Given the dynamic mission environment of rapidly changing customer requirements, the PM must be able to meet the customer's requirements for new technology. This means providing the right system at the right place at the right time. The ORD is prepared by the customer to define the project requirements for the PM's command. It should describe the type of system needed, and its anticipated operational scenario in sufficient detail to allow for project planning and development. It includes key capabilities desired, the level of performance required, and affordability considerations.

Continued on next page

5.2.3.10 Project Documentation and Plans, Continued

5.2.3.10.4 Operational Requirements Documentation (ORD), Continued

Frequently, the ORD is prepared as a joint effort between the customer and the PM. Operators need confidence in their systems to complete their mission. It is the PM's responsibility to provide electronic systems and software that operates properly and meet their needs. The most cost-effective way to ensure system availability is to ensure system reliability. When customers provide operational system availability goals, electronics systems should meet or exceed those requirements. A properly crafted ORD will ensure that those goals are met. The ORD is the initial document in the system's life cycle. It is a living document and shall be updated to reflect any change to the system that is addressed there. The ORD addresses software and hardware required for a system.

5.2.3.10.5 Base Electronic Systems Engineering Plan (BESEP)

A Base Electronic Systems Engineering Plan (BESEP) shall be prepared to identify specific equipment requirements. The BESEP should discuss historical background, project, radiation hazards or safety considerations, environmental impacts, and electronic installation design. Additionally, the BESEP should discuss system checkout and acceptance, the physical plant and include those diagrams or tables necessary to clarify the narratives contained within the BESEP. The BESEP takes information from many different documents and combines them into one comprehensive document.

5.2.3.10.6 Installation Plan

The Installation Plan describes the procedure for getting the finished "accepted" system installed and operating properly in its intended environment. The plan should be written so the appropriate personnel would be capable of performing the installation. Step-by-step instructions are provided, including the approximate time to complete each phase of the installation.

5.2.3.10.7 Test Plans

Test plans provide a chronological listing of the tests to be performed, a complete listing of all equipment to be used, and a detailed explanation of the test procedures for the test configuration and the pass/fail criteria. Test data sheets shall be provided with the test plan and shall be used to record observed performance data. The tests shall be focused on satisfying the operational requirements of the equipment. The plan should include both testing in the laboratory and in the field and must ensure testing of all planned configurations. Understanding that during a system's life cycle there are several levels of testing, software shall undergo Unit, Integration, Engineering, and Final Acceptance testing. Each of the test will be recorded in a systematic method identified by the SMEF to provide information visibility to the PM.

5.2.3.10 Project Documentation and Plans, Continued

5.2.3.10.8 Engineering Certification

An Engineering Certification Checklist is used to "certify" the installation. The checklist should contain checks of all of the new/modified system functionality, as well as checking functionality of any ancillary equipment. The list should also contain checks concerning the quality of the installation; cables properly dressed, drawings properly "red-lined", training provided, etc. Signature blocks should be included for the installing activity and receiving unit. A copy should be left at the station and the original returned to the PM's command. A Requirements Matrix is a good tool to use as part of the Engineering Certification. The CO may use the Engineering Certification as part of, or in total, for the Operational Certification.

5.2.3.10.9 Training Plans

The Training Plan defines all internal and external training required, the responsibility for each, and the resources required (i.e. Funding). It includes the training requirements for ELC (Depot) and TRACEN Petaluma. The Training Plan also provides a training presentation to be followed during training at the installation site(s).

5.2.3.10.10 Equipment/ System Integrated Logistics Support plan

The Equipment/System Integrated Logistics Support Plan (EILSP) is a key document to establish all testing, installation, maintenance, funding, training, and logistics issues for electronic equipment or systems. Developing a thorough EILSP will facilitate development of the;

?? Configuration Management Plan,
?? Equipment Disposition Instructions,
?? Sparing levels,
?? Depot Changes,
?? Coast Guard Planned Maintenance System (CGPMS) additions/modifications,
?? Allowance Parts List (APL) and
?? Management Information for Configuration and Allowances (MICA) and the
?? BESEP.

NOTE:
The Configuration Management Plan drives/requires the development of an EILSP and other supporting documentation.

5.2.3.10.11 Configuration Management Plan (CMP)

The CMP is developed to provide a process for identifying and documenting the functional and physical characteristics of a system, controlling changes, and reporting and recording configuration information. The PM works together with the Configuration Manager to produce the CMP and to ensure all Configuration Status Accounting (CSA) information is updated accordingly. Configuration Control Board members are identified in the CMP.

5.2.3.10.12 Software Design Documentation

Software design projects have many other documents associated with the project life cycle. These documents mirror the requirements of MIL-STD-498, "Software Development and Documentation". Although adherence to this standard is no longer required in full, the following documents should be part of a software design project:

?? System/Subsystem Specification
?? Software Requirements Specification
?? Database Design Description
?? Interface Requirements Specification/Design Description
?? Software Development Plan
?? Software Design Description
?? Software Test Plan/Test Description
?? Software Product Specification (provided with all software releases)
?? Software Version Description (provided with all software releases)
?? Software Test Report (provided with all software releases)

5.2.3.10.13 MIL-STD-498

MIL-STD-498 contains Data Item Descriptions (DIDs), which explain the requirements of each document listed above. The DIDs should be tailored to fulfill the documentation requirements for the specific project. In addition to MIL-STD-498, several Commandant Instructions concerning software development must be followed. The Coast Guard Operations System Center (OSC) should be contacted concerning all software design efforts within their area of responsibility. Other software products shall be the responsibility of the assigned SMEF.

5.2.3.11 Technical Manuals

5.2.3.11.1 PM Responsibility for Technical Manuals

A technical manual is a publication that contains information essential to proper installation, operation, maintenance, and repair of specific systems or equipment. Although Project Officers do not develop technical manuals, they are responsible for ensuring technical manuals for the equipment and systems installed in conjunction with their project meet certain minimum requirements necessary for proper operation and maintenance. The type of equipment or system installed, the level of maintenance and support required of technicians, and the target market for which the equipment was developed will dictate technical manual requirements.

5.2.3.11.2 Proper Instruction Preparation

Manuals for systems and equipment developed by or for the military services must be prepared in accordance with applicable military specifications and standards. Examples of systems and equipment that fall within this area include Navy-Type Navy-Owned (NTNO) Electronics Equipment outlined in Support of Navy-Type, Navy-Owned (NTNO) Electronics Equipment, COMDTINST M7100.2 (series). Identification of systems and equipment of military design or commercial electronic materiel that has been modified for military use and requires military identification and design control are identified by Joint Electronic Type Designation System (JTEDS) nomenclatures, e.g. AN/WSC-3(V). Acquisition of standardized systems or equipment which another military service has established Technical Manual Contract Requirements (TMCR) as part of the acquisition package requires the least amount of effort on the part of the Project Officer.

5.2.3.11.3 Acquisition of Non-Developmental Items (NDI) Manual Preparation

Acquisition of Non-Developmental Items (NDI) systems and equipment requires more involvement on the part of the Project Officer to ensure the technical manuals meet Coast Guard needs. NDI systems and equipment are often defined as off-the-shelf items modified or adapted through change to meet the needs of the military and design ownership is by an agent other than the military. These modifications may require the Project Officer to develop TMCRs addressing the development requirements of the technical manuals. Military Detail Specification MIL-DTL-24784A, Manuals, Technical: General Acquisition and Development Requirement provides the Project Officer with requirements for the acquisition and tailoring of technical manuals.

5.2.3.11.4 Acquisition of Commercial Off the Shelf (COTS) Manual Preparation

Acquisition of Commercial Off-the-Shelf (COTS) systems and equipment requires the Project Officer to analyze the commercial manual for completeness, accuracy, and adequacy of purpose to determine if further development is necessary. COTS is defined as systems or equipment offered in the open market; the design is controlled by the supplier. Often the maintenance philosophy of the system or equipment will dictate the need to define TMCRs necessary to modify the commercial manual to meet Coast Guard needs. In all cases, it is important for the technical manuals to be written concisely and clearly for the target population, taking into account that the target population may have less training and fewer skills than what was desired by the system designer. In the Coast Guard electronics community, the ET3 is the target population for technicians. Project Officers shall ensure acquisition of technical manuals written toward the target population of the ET3. MIL-HDBK-1221; Department of Defense Handbook for Evaluation of Commercial Off-The-Shelf (COTS) Manuals provides the Project Officer with criteria for evaluating manuals for acceptance. Manuals available off-the-shelf from commercial sources which include operation, maintenance, and other instructions to support equipment in the commercial market shall be acquired in accordance with MIL-DTL-24784/4.

5.2.3.11.5 Presentation of Technical Manuals

Presentation of technical manual information may be in any form or characteristic, however, with technological advances the implementation of a digital and paperless manual system is becoming standard. The move toward a digital and paperless manual system is also making technical manuals more interactive for the technicians. The Department of Defense developed the concept of Interactive Electronic Technical Manuals (IETM) with the aim of providing an interactive medium for technicians to quickly get data to operate, maintain, and repair complex systems and equipment. MIL-PRF-87268, Manual, Interactive Electronic Technical; General Content, Style, Format, and User Interaction Requirements contains common requirements for the general content, style, format, and user interaction features which are required for Interactive Electronic Technical Manuals (IETM). These IETMs are to be in digital form and are designed for interactive display to the maintenance technician or system operator end user by means of a computer controlled Electronic Display System (EDS). This specification provides requirements governing the creation of IETMs and the development of IETM presentation software. When preparing TMCRs, Project Officers shall also reference MIL-HDBK-511; Department of Defense Handbook for Interoperability of Interactive Electronic Technical Manuals (IETMs).

5.2.3.11.6 Modular Specification System

Naval System Data Support Activity, Code 5E30 at Port Hueneme Division, Naval Surface Warfare Center, Port Hueneme, CA, developed the Modular Specification System (M-SPECS) to aid acquisition managers and project officers in the development of TMCRs. M-SPECS is an online computerized program designed for the automated production of tailored TMCRs used in the procurement of technical manuals. M-SPECS TMCRs are tailored to the specific level, purpose, and end use requirements for optimum cost-effective acquisition and follow-on maintenance of technical manuals. The M-SPECS concept is based on creating a unique contractual document made up of paragraphs from existing specifications and standards. Only the paragraphs and associated artwork applicable to the unique technical manual procurement are assembled into the M-SPECS TMCR. Access to M-SPECS is available at the following Internet address: http://nsdsa.phdnswc.navy.mil/mspecs/mspecs.htm.

5.2.3.11 Technical Manuals, Continued

5.2.3.11.7 Operator's Guide (OG) or System Operator's Manual (SOM)

The OG/SOM is developed to provide system documentation and operating procedures for field unit personnel and engineers/technicians. The PM is responsible for the OG/SOM. The PM will ensure the OG/SOM is in the proper format, and request an Activity Control Number (ACN) from the ELC.

5.2.3.11.8 PM's Responsibility after Field or System Changes

Field or System Changes may be required when a new piece of equipment or modification to an existing piece of equipment is made in the field. All changes must be reported to the PM so that the impact to other equipment, Technical Manuals, Operator's Guides or System Operators Manuals (for systems in the field beyond the current project), can be assessed. An explanation of the types Field or Systems Change process is contained within section 5.2.7. (Alterations and System & Equipment Management) A SMEF or Equipment Manager (EM) will assist the PM with development and distribution of all Field Changes.

5.2.3.11.9 Issuing System documents

All system documents, including the Operator's Guide or Systems Operator's Manual, require a NSN. All NSN requests should include the document title, associated equipment information, and anticipated stock quantity and a copy of the document to ELC.

5.2.3.11.10 National Stock Number (NSN) and Nomenclature Requests

NSNs shall be assigned to the lowest replaceable unit (LRU) within a system. A list of LRU's will be forwarded to the ELC by the PM. This list should include mfr., part number, costs, item name, platforms the equipment or component and technical data. ELC will assign ACN's and NSN's as appropriate and complete any cataloging functions. The Program will be responsible for the initial population of ELC stock for all supported NSN's and providing on-board repair parts as identified in the APL's.

Nomenclature requests normally are in conjunction with NSN requests and shall be sent to the ELC Equipment Management Division. AIM/EIR nomenclatures are required for all CG Commandant (G-SCE) supported systems, such as Navigation and Communication systems.

5.2.3.12 ELC Projects

5.2.3.12.1 Management Information for Configuration and Allowances (MICA)	MICA establishes the material support for installed and portable equipment and lists equipment required to meet unit missions. MICA updates and changes are managed by ELC (016). Additional information can be found in Section 5.2.8 of this Manual.
5.2.3.12.2 Allowance Parts List (APL)	The PM, in cooperation with ELC, must determine the number of spares required for the project at both the unit level and depot/system stock. Provisioning technical data is provided to the ELC initiating the allowance list development. The PM through the configuration control process must also address changes that must be made to the equipments APL's. ELC will develop necessary NSN's and APL's, with the APL's matching the unit's configuration. ELC will load the APL's to the unit's configuration as outlined in Section 5.2.8 (Management Information for Configuration and Allowances (MICA)).
5.2.3.12.3 Equipment Disposition Instructions	Equipment Disposition Instructions are required whenever equipment is completely removed from the Coast Guard inventory. This means the Coast Guard no longer uses the equipment and support may be entirely terminated. The PM prepares a letter for Commandant (G-SCE) signature that includes a cover letter, equipment disposition instructions, and local disposal instructions in the Property Management Manual, COMDTINST M4500.5 (series).
5.2.3.12.4 Systems/Units Drawings	It is imperative the ELC and the PM have accurate drawings to reflect the current electronics configuration for the electronics installation. The PM is responsible to ensure drawings are updated properly during installation.

5.2.3.13 Recommended Reading

The following references should prove helpful to a Project Manager:

- ?? Standard Practice for Defense Specifications, MIL-STD-961D
- ?? SD-16, Communicating Requirements
- ?? Available from Document Automation and Production Service online database. http://astimage.daps.dla.mil/online

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5.2.4 Property Management

5.2.4.1 Overview

This section provides information for quick reference by electronics personnel. The basic authority on supply for the Coast Guard is the Supply Policy & Procedures Manual (SPPM), COMDTINST M4400.19 (series)

5.2.4.2 Supply Procedures Matrix

All Electronics procurement procedures formerly contained in this chapter are now listed in the SPPM below. Processes, which are no longer in use, are noted as "deleted". The following publications listed in the SPPM, provide guidelines and authority for supply. Those units not on the authorized Standard Distribution List (SDL) for these publications should initiate requests for addition to the SDL and direct their inquiries to the next senior in the chain of command in the interim.

For Information on:

Subject	**Reference**	**Link(s)**
Property	Policy and Procedures Manual (PPM)	
DD-1149	SPPM,PPM	http://cgweb.uscg.mil/g-s/g-lp/index.htm
DD-1348	SPPM, PPM	http://cgweb.uscg.mil/g-s/g-lp/index.htm
OPNAV 4790/CK	SPPM	http://cgweb.uscg.mil/g-s/g-lp/index.htm
COMSEC Equip.	CMS Manual	
Inventory Management		
CMPlus	CMPlus Users Guide	
Electronic Equip	CMPlus Users Guide	
General Purpose	SPPM	http://cgweb.uscg.mil/g-s/g-lp/index.htm
OM&S	PPM	http://cgweb.uscg.mil/g-s/g-lp/index.htm

Subject	**Reference**	**Link(s)**
Nomenclature	ELC(021)	
Mandatory Turn In (APA/XB) Emergency Requisitions	ELC Elex Support Gram, SPPM	http://cgweb.elcbalt.uscg.mil/docs/mti/mti.htm
Equipment Accountability	PPM	
Custodial Responsibilities	PPM	
Acronyms, AIM, EIR, CMPlus, DAAS…	SPPM	http://cgweb.uscg.mil/g-s/g-slp/index.htm
Equipment Disposition (Install/Deinstall)	SPPM PPM	http://cgweb.uscg.mil/g-s/g-slp/index.htm
Unserviceable (Repairable) Tag – Materiel (DD-1517-2)	ELC Support Gram SPPM	http://cgweb.elcbalt.uscg.mil/sptgram/default.htm
Electronics Equipment Requisition Message	ELC Support Gram	http://cgweb.elcbalt.uscg.mil/sptgram/default.htm
Non-Av DLR (Navy Turn-In)	SPPM Commandant (G-SCE)-2	http://cgweb.uscg.mil/g-s/g-slp/index.htm

5.2.4.3 Other References

The following references may be helpful to the reader:

Title:		
a.	Supply Policy & Procedures Manual (SPPM),	COMDTINST M4400.19 (series)
b.	Electronics Materiel Identification Manual	ELCINST M4410.5 (series)
c.	Aeronautical Engineering Maintenance Management Manual	COMDTINST M13020.1 (series)
d.	Aircraft Material Stocking List	CG-298
e.	E/GICP Appropriation Purchase Account (APA)Repairable Electronic Program	E/GICP 4408.1 (series)
g.	E/GICP-Repair Depot Transaction Procedures	E/GICP 4710.1 (series)
h.	MLCLANT Standard Operating Procedures (SOP)	
i.	Maintenance Logistic Command Pacific Area Command (MLCPAC) Telecommunications Systems Support Instructions	MLCPACINST M.10550.1 (series)
j.	Activity Address Directory (Section IX)	DOD 4000.25-D-DOD
k.	Defense Logistics Services Center Catalog Management Data	(CMD) (Microfiche)

Continued on next page

5.2.4.3
Other References, Continued

l.	Navy Stock List of Publication and Forms (Microfiche)	NAVSUP-2002
m.	ELC Support Gram	ELC-02 Equipment Mgmt Br
n.	LORAN-C Frequency Standard Set Operator's Guide	LSU Publication

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5.2.5 Certification of Electronics Equipment Installations

5.2.5.0.1 General

Certifications of electronics installations verify that equipment arrangement and installation details conform to the class/platform drawings and good installation practices. Controlling equipment additions and configuration through certification ensures that space and weight limitations are used effectively. It also promotes standardization, which reduces design costs of present and future installations by allowing for development and maintenance of drawings effective for all cutters within a class. It simplifies the preparation of specifications for future equipment installations.

5.2.5.0.2 Certification Types

The type of certification required will be indicated in the engineering approval document. There are three types of electronics certification listed below:

Type	Description
A	These certifications are required for installations of equipment or systems, which are directed by or reported to another Agency. Commandant (G-SCE) will perform type A certifications or a Commandant specified activity, such as SPAWAR.
B	These certifications are required for installations of equipment or systems under an AC&I or OE contract which requires certification by the Coast Guard as part of the contract or project. Commandant (G-SCE) will certify the initial installation and the MLC shall be responsible for certifying subsequent installations.
C	These certifications are required for installations of equipment or systems for which specific operating parameters must be confirmed or tested to ensure compliance with regulations or law. The MLC shall be responsible for certification of these installations.

5.2.5.0.3 Contents

This section contains the following topics:

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5.2.5.1 Certification Responsibilities for Installations by CG Yard

For those installations performed at or by the Coast Guard Yard, the following responsibilities apply:

5.2.5.1.1 Commanding Officer, CG Yard

The Commanding Officer, Coast Guard Yard shall:

1. Prior to certification, and upon receipt of a statement of work, furnish the Project Coordinator with cost estimates on material and man-hours for each electronics installation. Prior to certification, coordinate with the Project Coordinator to ensure all materials necessary for electronic installations are made available for retrofit.
2. For Class A and initial Class B installations, notify Commandant (G-SCE), the MLC commander, area or district commander, and the cutter commanding officer at least ten working days prior to the scheduled certification.
3. For the duration of the certification, furnish one electronic specialist for the certification team. A Chief Warrant Officer (ELC) is preferred, but a Chief Electronics Technician may be assigned if a Chief Warrant Officer is not available. Provide the commanding officer of the ship with necessary security clearances for yard personnel participating in the certification.
4. Ensure that two sets of applicable current drawings are on board prior to the scheduled certification commencement time.
5. Ensure that other shipboard/yard activities (availability of ship's power, rigging work, etc.) that would interfere with the certification effort are not scheduled concurrent with the certification.
6. Arrange for a meeting room for team use before and during the certification.
7. Provide training to ship's technicians on effected electronics equipment.
8. Upon completion of the certification, provide the ship with two sets of electronic drawings.
9. Upon receipt of the certification report, correct all discrepancies identified as yard responsibility, and furnish Commandant (G-SCE) with completion dates.

5.2.5.1.2 Cognizant Area or MLC Commander duties

The cognizant Area or MLC Commander shall:

1. For the duration of the certification, furnish one electronic specialist for the certification team. A Chief Warrant Officer (ELC) is preferred but a Chief Electronics Technician may be assigned if a Warrant Officer is not available.
2. Provide the commanding officer of the ship with necessary security clearances for all personnel participating in the certification.
3. Upon receipt of the certification report, correct all discrepancies identified as MLC or area responsibility and furnish Commandant (G-SCE) with completion dates.
4. Retain a copy of certification reports and review the discrepancy list.
5. Identify and provide any calibrated test equipment required by the certification team and ensure that it is on board the unit prior to the scheduled commencement of certification.

5.2.5.1.3 Commanding Officer Unit duties

The Commanding Officer of the cutter being certified shall:

1. For the duration of the certification, furnish one electronic specialist to the certification team. A Chief Warrant Officer is preferred but the senior electronic technician onboard may be assigned if a Warrant Officer is not available. Where circumstances warrant, the commanding officer shall provide additional members, such as EM, ET, FT, TT ratings.
2. Ensure that those electronics systems complementary to the systems being certified are operating properly.
3. Identify and provide calibrated test equipment with all required adapters not acquired by the certification team and ensure that it is on board the unit prior to certification.
4. Obtain quotas for training of appropriate cutter personnel. Training should be completed prior to certification. This includes requisition of necessary school quotas for new equipment operation and maintenance training. Ensure that Electronics Technicians are available for training on electronic installations done by the CG Yard.

5.2.5.1.4 Commandant (G-SCE) duties

Commandant (G-SCE) shall assign one electronic specialist (officer or senior enlisted) as the certification team leader for Type A and initial Type B electronic installations, regardless of the rank of the other team members. The senior MLC or district electronic specialist will be the team leader for all other installations.

5.2.5.1.4.1 Type A and B Installations

Type A and B installations the Commandant (G-SCE) shall:

1. Coordinate the administrative arrangements and outline responsibilities of the certification team.
2. Meet with the CG Yard team members prior to the certification to coordinate team efforts.
3. Within 30 days after completion of the certification, furnish the appropriate MLC area, district commander, the unit commanding officer, and the CG Yard with a certification report.

5.2.5.2 Installations by Other Activities

The certification responsibilities of involved commands for electronics installations accomplished at activities other than the Coast Guard Yard are:

5.2.5.2.1 MLC, Area or District Commander duties

The MLC, area or district commander shall:

1. Notify Commandant (G-SCE) at least 10 days prior to the scheduled certification for Type A and initial Type B installations.
2. For the duration of the certification, furnish one electronic specialist to the certification team. A Chief Warrant Officer is preferred but a Chief Electronics Technician may be assigned if a Warrant Officer is not available. Provide the commanding officer of the ship with necessary security clearances for all personnel participating in the certification.
3. Provide the ship with two sets of electronic drawings upon completion of the certification.
4. Identify and provide any test equipment required by the certification team and ensure that it is on board the unit prior to the scheduled commencement of certification.
   Ensure that other shipboard activities will not interfere with the certification team. Ensure that those systems complementary to the systems being certified are operating properly.
5. Arrange for a team meeting room to conduct business before and during the certification.
6. Upon receipt of the certification report, correct all discrepancies identified as MLC, area or district responsibility, and furnish Commandant (G-SCE) with completion dates.

5.2.5.2.2 Commanding Officer, Unit duties

The Commanding Officer of the unit being certified shall:

1. Provide at least one member of the certification team. Where circumstances warrant, the CO shall provide additional members (such as EM, ET, FT, TT ratings)
2. Ensure that other unit activities will not interfere with the certification team.
3. Ensure that those systems complementary to the system(s) being certified are operating properly.
4. Request quotas for training of unit personnel. Ideally, training should be completed prior to certification. This includes requisition of necessary school quotas for new equipment operation and maintenance training.
5. Retain a copy of certification reports and review the discrepancy lists in planning for future availabilities.

5.2.5.2.3 Commandant (G-SCE) duties

The Commandant (G-SCE) shall:

1. Furnish at least one member of the certification team for Type A and initial Type B electronic installations.
2. The senior Commandant (G-SCE) team member will be the team leader, regardless of the rank of the other team members, for all Type A and initial Type B certification.
3. The senior MLC team member will be the team leader for all other certifications.

5.2.5.2.4 Team Leader duties

The team leader shall:

1. Coordinate certification meetings and outline responsibilities of the certification team.
2. Meet with key personnel prior to the certification to coordinate team efforts.

Continued on next page

5.2.5.2.4 Team Leader duties, Continued

3. Ensure that the cutter holds all applicable drawings. Using the equipment arrangement drawings, ensure that all equipment is installed at the designated locations. Inspect the following items to ensure acceptable levels of workmanship. Note that installation standards and standards of workmanship should be specified in the general specifications, installation drawings, etc. It must be emphasized that the role of the certification team in a situation where workmanship is poor, but no standards have been established, is limited to that of observing and reporting discrepancies. The responsibilities for correction of the deficiencies will vary with the situation.
    a) Equipment foundations - Are they adequate?
    b) Cable runs, connections and labels - Are the cables properly terminated, secured, bonded, tagged, etc.? Are cables sized properly for their intended functions?
    c) Grounding/Bonding - Is the ship/facility adequately grounded/bonded? Is equipment grounded/bonded?
    d) Power panels and connecting boxes - Is equipment connected to correct breakers? Are breakers of proper size and adequately labeled?
    e) Equipment positioning - Is equipment positioned for easy maintenance; will the equipment open fully, extend fully etc.?
    f) Wave guide/Antenna Feeds - Is wave guide/antenna feed run properly, free of bends and dents? Are appropriate accessories (bends, twists, adapters, flanges, etc.) used?
    g) Penetrations - Are penetrations of watertight boundaries properly made and sealed?
    h) Housekeeping - Have the equipment and the areas surrounding the equipment been cleared, debris removed, nicks and scratches touched up, etc.?
    i) Adjacent equipment and spaces - Have other nearby equipment or spaces been damaged by the installing activity and not corrected?

Continued on next page

5.2.5.2.4 Team Leader duties, Continued

4. Require that all appropriate unit personnel operate all equipment to be certified and that the unit's electronics technicians demonstrate sufficient knowledge of equipment to maintain it.
5. Verify whether the necessary schools have been accomplished or scheduled. Verify that all applicable field changes are installed.
6. At the end of each certification work day, review discrepancies and compile a discrepancy listing. Pass the discrepancy list to the installing facility or contract supervisor for corrective action.
7. Ensure that the certification team does not become involved in correcting discrepancies during the certification. If equipment failures or incomplete or improper installations preclude completion of the certification, then as much as possible shall be performed. The team shall then recess until the certification can be completed.
8. Following completion of the certification, arrange to meet with all team members, including the cutter commanding officer if available. If the commanding officer isn't available, request to meet with the executive officer. Furnish a rough draft of discrepancies to the unit and installing activity.
9. Submit a memorandum documenting the results of the certification not more than 30 days after certification completion. If the team leader was assigned by Commandant (G-SCE), the memorandum will be addressed to the appropriate operational commander, with a copy to the unit. If the team leader was assigned by the MLC, the memorandum will be addressed to Commandant (G-SCE), with a copy to the unit. Figure 5.2.5-1 and Figure 5.2.5-2 at the end of this section are samples of a certification memo with a list of discrepancies. The certification memo should include the following:
    a) References - All applicable references, Approved Engineering Changes, Projects, and Table of Electronic Drawings (TEDs) should be listed.
    b) Tests - If any tests other than equipment operation were performed, then these tests should be listed.

Continued on next page

5.2.5.2.4 Team Leader duties, Continued

c) Installations - List all installations and annotate which were satisfactory or unsatisfactory.
d) Discrepancies - List all discrepancies and the recommended party responsible for correction.
e) Training - List all training performed by the installing activity or contractor.
f) Recommendations - Provide any recommendations concerning changes to unit, system or equipment configurations or unsatisfactory installations.
g) Commendatory remarks - Include any commendatory remarks concerning the quality of work performed, if appropriate.

Upon receipt of the certification team report, the MLC, area or district commander shall initiate appropriate corrective action.

5.2.5.3 Schedule of Certification Events

5.2.5.3.1
Prior to Certification

Prior to commencement of certification, the team leader shall verify that:

1. Appropriate team members have been designated.
2. Drawings are available for the certification.
3. A meeting room has been arranged for.
4. An informal outline of particular tasks to be conducted has been prepared by the team.

5.2.5.3.2
Conducting Certification

To conduct the certification, the team leader shall:

1. Assemble team and review tasks outlined; discuss any pertinent changes to drawings or project requirements.
2. Verify that shipboard configurations are in agreement with arrangement drawings.
3. Check equipment foundations against foundation drawings.
4. Check power panels for correctness against power distribution drawings.
5. Check cable runs and connections, equipment bonding, antenna installation, welding, and painting.
6. Request that ship personnel operate each equipment while certification team member(s) watch; question personnel concerning operation and maintenance of equipment.
7. Verify that necessary equipment school training has been accomplished or is scheduled.
8. At the end of each certification work day (in conjunction with the team) review discrepancies and compile a discrepancy listing for the installing activity or contractor. The installing activity or contractor may then begin to correct discrepancies.

Upon completion of the certification, the team leader shall arrange to meet with all interested parties, including the unit commanding officer. If the commanding officer isn't available, the executive officer shall attend.

5.2.5.4 Standardization

5.2.5.4.1 Overview

Standardization ensures that common equipment and procedures exist in as many places as feasible. As a general rule, standardization reduces training costs, allows flexibility in personnel transfers, improves equipment support, and reduces overall life cycle logistics costs. The decision of whether to standardize is determined by the program manager during the acquisition and re-capitalization process, and is based on a number of criteria; including, equipment life cycle, retrofit costs, or field input as part of the Engineering Change Request (ECR) process. Anytime a change extends beyond one platform, standardization shall be considered.

5.2.5.4.2 Policy

This section specifies Commandant (G-SC) control over the equipment types installed, conforming to TEMPEST and other technical performance requirements, vessel weight and moment status, and the antenna configuration, but allows local discretion for location and arrangement of displays and controls and so forth. Typical class arrangement drawings for major cutter classes will be managed by Commandant (G-SEN) and shall be provided with Engineering Changes for guidance purposes. MLCs are responsible for preparing and maintaining such engineering drawings (above and beyond those provided by Commandant or headquarters units) as may be necessary for equipment installation, availabilities, and other purposes for those vessels where the arrangements differ from those typical of the class. Secondary equipment re-arrangements made necessary by the later installation of new equipment provided by Commandant are the responsibility of and must be funded by the cognizant MLC Commander. When necessary Commandant (G-SE) may require installations exactly according to the drawings. In these cases, this will be noted prominently on all Engineering Changes and deviations will not be permitted.

5.2.5.4.3 Vessel Standardization Policy

Commandant (G-SC) will either provide or specify the electronic equipment that is authorized for installation by Engineering Changes. If manufacturer and model number of the equipment are specified, no deviation is acceptable without prior approval from the alteration approving authority. Certain variations in installation details are permissible within the limits described below. All antennas and transducers are to be installed, both physically and electrically, as specified by Engineering Changes or such drawings or documents as they may refer to, except where prior approval of deviations has been obtained from the alteration approving authority. Unless specified otherwise, all equipment installed in the "Secure Communications Spaces" of ships equipped with on-line cryptographic equipment must be installed, both physically and electrically, as specified in the applicable Engineering Changes associated engineering drawings, and Computer Operated Engineering Data (COED) lists. Cryptographic equipment installed in other compartments, such as in Combat Information Center (CIC), must also be installed in accordance with the requirements of the applicable Engineering Changes. These requirements may include a prohibition against the installation of other equipment within a specified distance. All other electronic equipment may be installed as directed by the cognizant MLC, area or district commander except for the following:

- ?? The equipment must be installed in the compartment specified in the Engineering Change. Equipment other than antennas installed on the weather decks, such as antenna couplers, shall be installed on the deck specified (i.e., at the same water line) but may be moved horizontally (i.e., fore and aft or athwart ships) up to 4 feet without being subject to obtaining prior approval.
- ?? The equipment shall be wired and interconnected as shown or specified by the Engineering Changes, or COED list.

5.2.5.4.4 Shore Standardization Policy

Commandant (G-SCT) requires the installation of standard equipment at shore units when one or more of the factors listed below apply. When the equipment is specified or provided, the substitution of other equipment is not authorized without prior approval. The equipment may be arranged (within the room or building) at the discretion of the appropriate area, MLC or district commander unless otherwise specified in the engineering approval documentation. Typically, equipment arrangements will be specified when they affect performance or TEMPEST requirements. Standard equipment must be used when:

?? The equipment is maintained under a service-wide contract.
?? Significant economies of training or logistics can be shown.
?? The procurement or use of the equipment is limited by law, regulations, or tariff (examples are telephone and computer equipment).
?? The operational specifications of the equipment are critical to mission performance.
?? The equipment must operate with standard computer software, or software that is under configuration control by Commandant.
?? The equipment is specified or provided.
?? Substitute equipment is not authorized.

5.2.5.4.5 Computer Software Modification

A change of any size (e.g., one or more program statements) to computer software provided by Commandant (G-SCC) or by any SMEF is considered a change to the equipment itself and is forbidden unless it is approved in accordance with the established change process and documented. Specific configuration control policies for an information system have been established. Those policies supersede this paragraph. This computer software modification policy applies only to software or firmware related to electronic equipment or systems directly supported by Commandant (G-SC) or by a SMEF.

5.2.5.4.6 Equipment for Non-Standard Boats

Non-standard boats are those for which maintenance and configuration control responsibility has been passed to the MLC. Non-standard boats will be outfitted with the same make and model equipment installed on similar standard boats unless otherwise directed by Commandant (G-SCE). The MLC or district will fund procurement, replacement, installation, and maintenance of electronic equipment for non-standard boats. Commandant will include known requirements for equipment for non-standard boats in procurement planning of standard equipment or systems.

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: G-SCE
Phone: (202) 267-XXXX
Fax: (202) 267-4617
Email:

10550
20 Jun 2002

MEMORANDUM

From: John Doe, Rank

Reply to
Attn of:

To: Commandant (G-SCE)

Subj: TYPE A ELECTRONICS INSTALLATION CERTIFICATION OF USCGC CERT (WHEC 174)

Ref: (a) Electronics Manual, COMDTINST M10550.25A
(b) SHIPALT 378-B-204
(c) CG Yard Project 17214

1. As outlined in reference (a), a Type A certification of electronic equipment installed on CGC CERT was performed by the following personnel from 1 to 4 September 1998:

LT SMITH COMDT (G-SCE)
CWO SMITH CG YARD
CWO SMITH MLCLANT (te)
CWO SMITH CGC CERT
ETC SMITH CGC CERT

2. All installations authorized by references (b) and (c) were done satisfactorily with only minor discrepancies. The installations certified were the following:

AIMS-MK-XII-IFF System
TDL-708 LORAN-C Receivers
SR-216 MF Transmitters
Constant Level Amplifiers
Rewiring of CIC Evaluator

3. Enclosure (1) is a list of minor discrepancies. Parties responsible for correcting discrepancies are also listed.
4. Installations made by CG Yard personnel were done in a professional manner. Cooperation of shipboard personnel was excellent.

#

SAMPLE CERTIFICATION MEMO
Figure 5.2.5-1

Enclosures: (1) List of Discrepancies
Copy: MLC(t) (as appropriate)
COMDT (G-SCE) (if applicable)
CGC CERT(WHEC-174)
CG Yard
G-S Centers of Excellence as Appropriate

SAMPLE CERTIFICATION MEMO

Figure 5.2.5-1

LIST OF DISCREPANCIES

1. Power feed cable to panel (01-156-2) in STTY not labeled. (CG Yard correct.)

2. Power feed cable to panel (01-158-1) in the Air Search Radar Room not labeled. (CG Yard correct).

3. Power panel (01-156-2) in STTY:
   a. Feeder cable tag information incorrect. (CG Yard correct).
   b. Feeder cable information not contained on power panel label. (CG Yard correct).

4. Power Panel (01-155-1):
   a. Label plate missing. (CG Yard correct).
   b. Incorrect label on feeder cable. (CG Yard correct).

5. Feeder cable to power panel (01-155-0) incorrect. (CG Yard correct).

6. No label on power panel (01-146-22). (CG Yard correct).

7. The AN/UNQ-7D Tape Recorder used with the ESM system was inoperative. (Ship's force correct).

8. The modifications to the towed body storage rack in the Sonar Equipment Room were not accomplished due to delay in parts delivery. (District correct.)

9. The VHF-FM antenna (Type 925) should be replaced with a Columbia Products Mode 420 (District correct).

(TYPED OR STAMPED LOWER RIGHT CORNER OF THE PAGE) “ENCL (1)”

SAMPLE LIST OF DISCREPANCIES

Figure 5.2.5-2

5.2.6 Maintenance

5.2.6.0.1 Overview

Electronics equipment maintenance is accomplished at three levels, organizational, intermediate and depot. This chapter covers general maintenance concepts and procedures. Equipment technical manuals should be referred to for corrective maintenance procedures.

5.2.6.0.2 Required Maintenance Reporting

Both corrective and planned maintenance **shall** be tracked, updated and maintained using CMPlus.

5.2.6.0.3 Contents

This part contains the following topics:

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5.2.6.1 Maintenance Levels

5.2.6.1.1 Organizational Level Maintenance

Organizational Level Maintenance is defined as, on-site maintenance performed on a unit's equipment by personnel assigned to that unit. The scope of maintenance performed at this level depends on the capabilities of the unit's personnel.

For example,

With Technicians	For a unit with a large, well equipped maintenance force, organizational level maintenance will typically include inspection, cleaning, lubrication, adjustment, trouble shooting, fault isolating and replacement of failed components.
Without Technicians	For a unit with no ETs assigned may consist only of noting that a failure has occurred, recording the symptoms and notifying the intermediate level maintenance facility.

5.2.6.1.2 Intermediate Level Maintenance

Intermediate Level Maintenance is defined as maintenance or technical assistance provided by designated field maintenance activities in direct support of organizational level units. This maintenance is performed by activities such as electronic support units, electronic support detachments, district or group maintenance personnel, commercial repair activities, etc.

5.2.6.1.3 Depot Level Maintenance

Depot Level Maintenance is performed at centralized repair facilities. These activities normally do not provide direct support to other levels of maintenance, but rather support the logistics "pipeline" by repairing and returning items to a ready-for-issue (RFI) status. They receive failed items from the Inventory Control Point (ICP) and return RFI items to the ICP. Depot level activities may be either Coast Guard, commercial or other government agencies (OGA); it is the responsibility of the ICP to direct failed items to the appropriate depot level facility for repair.

5.2.6.1.4 Planned Maintenance

Planned maintenance consists of a schedule of tests, adjustments, alignments, inspections, cleaning, lubrication and preservation to maintain equipment performance at design standards.

There are three planned maintenance processes:

?? Coast Guard Planned Maintenance System (CGPMS)
?? Navy Planned Maintenance System (NPMS)
?? Locally Planned Maintenance System (LPMS)

5.2.6.2 Coast Guard Planned Maintenance System (CGPMS)

5.2.6.2.1 Overview

Significant reductions in corrective maintenance have been obtained at units using CGPMS. CGPMS procedures shall take precedence over all other forms of planned maintenance including NPMS and locally developed maintenance procedures (LPMS). **Use of the CGPMS materials is mandatory at all Coast Guard units. Requirements are detailed in the "CGPMS User Guide."**

NOTE:

Other forms of planned maintenance systems (PMS) are not authorized when CGPMS is available. When CGPMS is not available, NPMS shall be performed, if applicable, or the unit will develop LPMS.

5.2.6.2.2 Waiver Requests

Requests for permission to depart from the policies and responsibilities described in this chapter are to be forwarded to Commandant (G-SCE) via the appropriate Commander, Maintenance and Logistics Command and the Engineering Logistics Center.

5.2.6.2.3 Objectives

The objectives of using CGPMS are…

?? To provide a standardized planned maintenance program for electronic equipment within the Coast Guard as well as the necessary and required tools to plan, schedule, and perform effective planned/preventive maintenance.
?? Serve as a training tool for inexperienced technicians to familiarize them with new equipment.
?? Provide maintenance hour's data that is used to model staffing standards for Coast Guard units.

5.2.6.2.4 Contacting the CGPMS Contractors

You can contact the CGPMS contractors via email or telephone. Listed below is the contact information:

OFFICE PHONE: 703-273-4775
OFFICE FAX: 703-691-8105
CGPMS TOLL FREE; 1-888-872-4767
EMAIL ADDRESS: mail@cgpms.com

5.2.6.2 Coast Guard Planned Maintenance System (CGPMS), Continued

The familiar maroon colored Work Schedule Books (WSB) contains all the components comprising CGPMS.

5.2.6.2.4 CGPMS Documents

User's Guide	A detailed explanation of the various components of CGPMS and how they are used. The User Guide is updated on an as needed basis and can be ordered from Engineering Logistics Command by Feedback Report (FBR), Rapidraft letter or E-Mail, CGPMS/G-S.
List of Effective Index of Maintenance Procedures	Lists all CGPMS material for electronic equipment installed at or supported by the unit. Provides total annual maintenance hours for all the listed equipment.
Index of Maintenance Procedures (IMP) and Maintenance Procedure Card (MPC	The IMP is an index of all applicable MPCs for a given equipment or system and contains the Technical Data Record (TDR), Form CG-5455A, for certain technical parameters which need to be monitored and recorded. MPCs are step-by-step maintenance actions to be performed on an electronic equipment or system.
Master Index	Provides a complete listing of all available CGPMS procedures. A listing of Navy Maintenance Index of Procedures (MIP) and ordering instructions are also provided for Navy equipment used by the Coast Guard.

5.2.6.2.5 CGPMS Forms

The following forms are used with the CGPMS and are available in Forms Plus (SWII), Jet Form Filler (SWIII) and/or from the CGPMS Manager at the ELC.

CG5452 and CG5453 Schedules	These forms are used by the technician to plan, schedule and display planned maintenance for a specific unit monthly and/or annually. Scheduling activities at a unit help distribute the technician(s) CGPMS workload and maintain equipment reliability. Local conditions may require adjustment to the maintenance schedule (underway, special projects, travel restrictions).
CG5454 Equipment History	This form is used to record equipment maintenance history and comments. This form shall be used if no Technical Data Record (TDR) is provided for equipment or to record information in addition to that required by the TDR.

5.2.6.2.5 CGPMS Forms, Continued

CG5451 Feedback Report	Local recording of CGPMS actions is required, either by entering the information in CMPlus (when installed) or by using the CGPMS forms when CMPlus is not available. Recommendations for improvement of the CGPMS are encouraged, and should be submitted to the CGPMS Manager using the Feedback Report (FBR) form. The main objectives of FBRs form is to report deficiencies or recommendations for changes in CGPMS as well as administrative and miscellaneous CGPMS requests or comments. The FBR form is a three part carbonless form. FBR forms are provided with each initial CGPMS package. FBRs are divided into several categories as follows:	
	Technical FBRs	Describe technical discrepancies or technical problem areas encountered with CGPMS. Each technical FBR should address only one subject or technical problem. Technical FBR's may include: ?? Personnel and equipment safety. ?? Equipment design and configuration reporting problems. ?? Procedure discrepancies.
	Non-Technical FBRs	Provide administrative feedback. Each non-technical FBR may address several problems or requests. Examples of non-technical FBRs are: ?? Missing or mutilated pages. ?? Modification or update of a unit's CGPMS package. ?? General comments concerning CGPMS. ?? Ordering CGPMS forms or additional procedures

5.2.6.2.5 CGPMS Forms, Continued

	Safety Related FBRs	Are to be taken very seriously. When the reason for submission of a CGPMS FBR involves safety of personnel or damage to equipment, the FBR is considered URGENT. Urgent FBRs shall be sent by PRIORITY message to the CGPMS Manager at the ELC with the cognizant MLC(t) and SMEF as info addressees. A follow-up CGPMS FBR will be submitted to amplify information reported in the message. Messages regarding Navy-owned or Navy-type CG-owned equipment will be forwarded to NAVSEACEN and NAVSAFECEN with Commandant (G-SCE-2) as an info addressee.
	Carbonless FBRs	The original (white) and any amplifying documentation is to be sent to the CGPMS Manager. The yellow copy is to be sent to the cognizant MLC (t) with any amplifying documentation. The originator shall retain the pink copy.
	Forms Plus/Jet Form FBRs	Computer forms will automatically print three copies of the completed FBR. They label the copies as either Headquarters, MLC or originator copy. Forward each FBR copy, along with any amplifying documentation, as indicated in the lower right corner of the FBR.

5.2.6.2.5 CGPMS Response to FBR's

The CGPMS Manager will respond to each FBR with a letter of acknowledgment. The letter will be sent to the reporting activity with a copy to the appropriate MLC. Feedback reports requiring additional review prior to action will be identified in the acknowledgment letter. The CGPMS Manager will coordinate technical reviews by other activities. The CGPMS Manager will send a copy of Technical FBRs and associated documents to the appropriate System management Engineering Facility or Equipment Manager.

5.2.6.2.6 CGPMS Sponsor

Under the guidance and direction of the Director, Command, Control, Communications & Computers (C4) Directorate (G-SC), the Office of Electronics Systems (G-SCE) is the authority and sponsoring activity for the Coast Guard Planned Maintenance System (CGPMS) for electronic systems.

5.2.6.2.6.1 CGPMS Sponsor Commandant (G-SCE) and Program Manager Responsibility

Commandant (G-SCE) will:

?? Establish, develop and promulgate the overall policy and direction for the CGPMS program.
?? Review the total resources requested for the operation, support, and improvement of the CGPMS program.
?? Approve management applications of CGPMS data and documentation.
?? Provide instructions and technical direction for the CGPMS program.
?? Final approval authority for all maintenance procedures.

5.2.6.2.6.2 CGPMS Sponsor ELC Responsibility

The ELC is the assigned COTR for CGPMS and will:

- Place equipment requesting maintenance evaluation on the Candidate Equipment List.
- Monitor CGPMS Feedback Reports, including coordinating timely resolution of technical and safety issues with the appropriate SMEF.
- Provide a single point of contact for the Navy concerning electronic NPMS.
- Disseminate Navy NAVSEACEN advisories regarding urgent safety-related issues on electronics equipment common to both CGPMS and NPMS.

5.2.6.2.6.3 CGPMS Sponsor MLC Responsibility

The MLC will:

- Ensure the prescribed test equipment or its equivalent is available for each unit to perform CGPMS and NPMS maintenance procedures.
- Review FBRs (CG-5451) and Navy Feedback Reports (OPNAV 4790/7B) from units under their cognizance and provide comments to the CGPMS Manager, as appropriate.
- Monitor CGPMS performance at units under their cognizance.
- Report safety, technical, logistics, and scheduling discrepancies, pertinent to CGPMS, to the CGPMS Manager.
- Assist the CGPMS Manager in coordinating CGPMS field unit visits.
- Provide the CGPMS Manager advance notice of all additions or deletions of test equipment supplied or supported by MLC.

5.2.6.2.6.4 CGPMS Sponsor SMEF Responsibility

The SMEFs will:

?? Assist the MLC in determining test equipment inventories and CGPMS requirements for units within their area of responsibility.

?? Assist the MLC in monitoring performance of CGPMS within their area of responsibility.

?? Advise the appropriate MLC of problems relative to the operation, safety, logistics, scheduling, and management of the CGPMS program.

5.2.6.2.6.5 Training Center Responsibility

Coast Guard Training Center, Petaluma will institute CGPMS training in class "A" curricula for Electronics Technicians and Information Systems Technicians.

Coast Guard Reserve Training Center, Yorktown will institute CGPMS training in the Aid to Navigation (AToN) and Radar man curricula.

5.2.6.2.6.6 CGPMS Sponsor Unit CO Responsibility

The Commanding Officer (CO) or Officer in Charge (OinC) will:

?? Integrate CGPMS procedures into the unit's regular work schedule and ensure compliance Modify CGPMS scheduling to best-fit operational commitments.

?? Request required waivers of compliance from Commandant (G-SCE) via the appropriate MLC and the ELC.

?? Provide qualified personnel to perform CGPMS and forward Feedback Reports (FBR) to the CGPMS Manager when the indicated labor hours for an assigned maintenance procedure are not accurate.

?? If no Electronic Technician is assigned to the unit, the CO or OinC is responsible for ensuring the appropriate support facility maintains the unit's CGPMS.

5.2.6.2.6.7 If no Unit EMO

If the unit does not have an EMO, the Senior Technician assumes the appropriate responsibilities of EMO as well as those of Senior Technician. The senior technician is the senior technical supervisor (military or civilian) at the electronics facility. If no EMO is assigned to the unit, the Senior Technician will also assume the duties of the EMO.

5.2.6.2.6.8 CGPMS Sponsor EMO Responsibility

The EMO shall:

?? Ensure unit compliance with the requirements of the CGPMS in the division by:
  o Maintaining the CGPMS WSB
  o Reviewing and inspecting CGPMS work schedules to ensure they are current and complete.
  o Review FBRs
?? Brief the CO or OinC on the status of the unit's CGPMS.
?? Ensure CGPMS is in the unit's training schedule.

5.2.6.2.6.9 CGPMS Sponsor Senior Technician Responsibility

Senior Technician shall:

?? Schedule and perform Planned Maintenance.
?? Incorporate CGPMS into the unit's training schedule.
?? Initiate requests for CGPMS revisions.
?? Maintain a current CGPMS Library.
?? Ensure Equipment History Forms are complete and current.

5.2.6.2.7 Automatic Updates

Units will receive automatic shipments of updated CGPMS material as changes to the material occur or new equipments or systems are added to CGPMS. Automatic updates are based on current CGPMS records and the Electronic Installation Records (EIR) entered in the Accountable Item Management (AIM) central database.

5.2.6.2.8 Annual Updates

Each unit's CGPMS material will be updated annually. Annual updates are necessary to ensure the unit has the most current CGPMS material. The unit will receive CGPMS material based on previous requests submitted by FBRs, current CGPMS records and data contained in AIM (Central). Detailed instructions for completing the update are contained in the Annual Update package.

5.2.6.2.9 Requested Updates

Units may request revisions to its CGPMS material due to equipment changes by submitting an FBR to the CGPMS Manager.

5.2.6.2.10 Special Requests

Units may request CGPMS material for training or other reasons for equipment not actually installed at their unit or supported by their unit. The unit must submit an FBR stating their reason for requesting the additional material and whether they want to receive automatic updates for the new material. The special request will not be reflected the unit's LOEIMP total maintenance hours.

5.2.6.2.11 Initial Issue

Units, which support electronic equipment and are not currently participating in CGPMS, must submit a request by Rapid draft letter, fax or e-mail to the CGPMS Manager. A copy of the unit's latest Electronic Installation Record (EIR) must accompany the request.

5.2.6.2.12 Standard Workstation III

The Coast Guard Standard Workstation III (CGSWIII) does not have PMS requirements. The equipment shall be used till failure and then submitted for warranty repair.

5.2.6.3 Navy Planned Maintenance System (NPMS)

5.2.6.3.1 NPMS Overview

The Navy develops and provides PMS procedures for Navy electronic equipment. Coast Guard units are expected to use NPMS for Navy-owned or Navy-type Coast Guard-owned equipment.

5.2.6.3.2 NPMS Procedures

NPMS procedures may be ordered, at no cost. Units on the Navy PMS distribution list can order the necessary procedures by completing a Navy Feedback Report (FBR) form, OPNAV 4790/7B, and forwarding it to Naval Sea Support Center, Pacific.

Units not on the Navy PMS distribution list may send a letter requesting they be placed on the distribution list to:

Commanding Officer
Naval Sea Support Center, Pacific
P.O. Box 85548
San Diego, CA 92138
Attn. Code 914

The request letter must include a listing of Navy-owned or Navy-type Coast Guard-owned electronic equipment at the unit and all required Maintenance Index Procedure (MIP) numbers. Copies of Navy PMS correspondence, letters or OPNAV 4790/7B, will be forwarded to the CGPMS Manager and the appropriate MLC (t).

5.2.6.4 Locally Planned Maintenance System (LPMS

5.2.6.4.1 LPMS Procedures

A unit may use locally developed planned maintenance procedures whenever CGPMS or NPMS are not available for an equipment or system they support.

LPMS will be formatted as CGPMS and placed on a standard CGPMS MPC card. Monthly and Annual Schedules, CG-5452/CG-5453, and Equipment History Forms, CG-5454, will be used with LPMS.

A letter notification with all LPMS documentation shall be sent to the CGPMS Manager for review and possible inclusion in CGPMS.

5.2.6.5 Corrective maintenance

5.2.6.5.1 Overview and Procedures

Corrective maintenance of electronic equipment consists of the actions and operations needed to restore inoperative equipment, or equipment operating at a reduced capability, to a fully operative condition. Corrective maintenance actions may be those needed to repair equipment after a fire, to locate and then replace a defective component, or to locate a faulty function and then adjust its circuit for an output, which is within its specification. Common to each of these examples of corrective maintenance actions, and to all other corrective maintenance actions, is a sequence of operations that are always used:

1. Symptom Recognition
2. Symptom Elaboration
3. Listing Probable Faulty Functions
4. Localizing the Faulty Function
5. Localizing Trouble to the Circuit/Module
6. Failure Analysis

These steps taken in corrective maintenance are fully explained in the Electronics Installation and Maintenance Book (EIMB), NAVSEA SE000-00-EIM-160, General Maintenance.

There are three other steps to follow in the process of corrective maintenance:

?? **Failure Correction –** The equipment must be restored to operational condition. This would include performing an operational test, an alignment, an adjustment and/or calibration.
?? **Failure Reporting -** Updating the Coast Guard's current Configuration Data Management database.
?? **Parts Replenishment –** Consumables and parts must be reordered to restore the MICA.

5.2.6.6 Routine Maintenance

5.2.6.6.0.1 Overview

Routine Maintenance is the application of special procedures of inspection, cleaning and lubrication of equipment. The term "special procedures" is used because approved and standard methods are employed whenever such maintenance actions are performed.

CAUTION

Before attempting any maintenance work on electronic equipment, be sure to de-energize the equipment and tag the main circuit breaker to prevent it from being turned on by another person. Tagged switches should never be turned on or the tags removed, except by the person who tagged the switch. Repairs should never be performed on energized equipment. If doubt exists as to whether a circuit has been de-energized, it should be checked with a voltmeter. All exposed terminals and capacitors should be grounded and/or discharged using a grounding wand. Wiring diagrams should be checked for interconnections to other equipment, which may be supplying a voltage to the equipment under maintenance.

5.2.6.6.0.2 Examples

Certain approved methods have been developed for the cleaning and lubrication of radar antenna pedestals. Whenever a radar pedestal requires lubrication, it must first be cleaned using approved methods and solvents, and then it must be lubricated with the proper lubricant. Included with the lubricating instructions are lubrication charts, which specify approved lubricants and their general usage.

Such approved methods are routine because they apply whenever radar pedestals are lubricated and must be accomplished periodically.

Routine inspections include such actions as checking equipment ground straps for loose connections and broken or frayed straps, checking tightness of screws, bolts, nuts, checking oil reservoirs for the proper quantity of oil, checking front panel indicators and illumination for burned out bulbs.

5.2.6.0.2 Contents

This part contains the following topics:

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5.2.6.6.1 Cleaning

5.2.6.6.1.1 Overview

Cleaning is an important part of equipment maintenance and should be performed at regular intervals. Failure to keep equipment free of dust and foreign matter can seriously effect performance, and lead to an increased failure rate. Dust will accumulate in any piece of electronic equipment, particularly in high voltage circuits, and if allowed to remain, may combine with moisture in the air to form paths for arcs and short circuits. Dust also forms a thermal insulation and can prevent heat from dissipating to the surrounding air. This can result in the component overheating, which may alter the characteristics of and/or shorten its lifetime. Additionally, dust can combine with lubricants, forming an abrasive that damages moving parts.

5.2.6.6.1.2 Materials

Cleaning equipment should be done using a soft, clean, lint free cloth. Never use steel wool or emery cloth on electronic equipment. Do not use blowers or compressed air. Sandpaper and files should be used only as directed by competent authority. A vacuum cleaner with a nonmetallic nozzle may be used to remove dust and foreign matter. Approved cleaning solvents should be used to remove dirt film. Always observe proper safety precautions when using solvents. Exercise care when cleaning to prevent damage to components.

5.2.6.6.1.3 Air Filters

Air filters are placed in equipment to remove dust from the air used for cooling the equipment. These filters should be cleaned or replaced regularly. As dust accumulates, airflow is reduced causing equipment to overheat. Also, if dust is allowed to accumulate on the filter, larger particles of dust will be forced through the filter. In the absence of cleaning instructions, metal screen filters may be cleaned in warm soapy water and dried thoroughly before replacing. Some equipment may require a light film of oil be applied to the filter element. Check the equipment technical manuals and the EIMB, General Maintenance, NAVSEA SEOOO-OO-EIM-160 for more specific information. Paper and fiberglass filters shall be replaced when they become dirty.

5.2.6.6.1.4 Heat Sinks

Electronic component heat sinks are designed to utilize conduction, convection, and radiation to transfer the component’s heat to the surrounding air. Therefore, particular attention should be given them during maintenance to ensure that they remain free of dust and other foreign matter.

5.2.6.6.2 Lubrication

5.2.6.6.2.1 Overview

Electronic equipment, which has moving mechanical parts, may require periodic lubrication. Failure to lubricate shortens the life of the mechanical parts, and causes breakdown of electronic equipment. It is essential that maintenance personnel be thoroughly familiar with the lubrication requirements of the equipment they are responsible for. Proper lubrication of mechanical components in electronic equipment is emphasized in technical manuals and in reference standards books.

5.2.6.6.2.2 Types

The correct choice of a lubricant for electronic equipment is important, especially if the equipment is being operated under adverse conditions. To assist in the selection of the correct lubricant, tables of standard Navy lubricants and their uses may be found in the EIMB, General Maintenance Book, NAVSEA SEOOO-OO-EIM-160.

5.2.6.6.3 Environmental Effects

5.2.6.6.3.1 Overview

It is beyond the scope of this subsection to present all the problems encountered from environmental conditions because methods of installation and stowage of electronic equipment differ from ship to ship and from one shore station to another. However, some of the preventive and corrective measures are given in the following paragraphs.

5.2.6.6.3.2 Temperature

The cooling or heating of air spaces surrounding the components of electronic equipment is usually controlled by blowers, fans, hot oil and water coolers, etc., either to dissipate the heat generated by the equipment components, or to heat or cool the surrounding air. Regardless of the method employed for the cooling or heating of spaces, if maintenance personnel neglect to keep the equipment free of foreign matter, the heating or cooling may be greatly affected, which may result in equipment damage or malfunction caused by improper temperature control. To overcome adverse effects on electronic equipment, minimum and maximum temperature extremes must be controlled.

5.2.6.6.3.3 Humidity

Excess humidity may result in damage to equipment from condensation and fungus growth, under conditions of both salt-laden moist air and high temperatures. In either case, adequate ventilation of the equipment or humidity control is of the utmost importance in protecting equipment from trapped moisture and/or high operating temperatures.

5.2.6.6.3.4 Corrosive Atmosphere

To prevent corrosion, a regular periodic cleaning schedule should be established. This schedule should include cleaning, surface protection, lubricating moving parts, and the applying approved solvents or wetting agents to remove any accumulated foreign matter, such as soil, dust, oil film, salt-impregnation, and corrosion. In addition, all access doors and panels should be fastened securely and in place when no maintenance work is being performed on the equipment.

5.2.6.6.3.5 Storage

When electronic equipment and component parts must be stored or remain in an inoperative condition for a considerable length of time, additional preventive measures must be taken. New or repaired modular assemblies and parts are packaged in accordance with the applicable packaging specifications. When the outer bulky casing (crate or carton) is removed, the unit (or units) remains packaged in a waterproof bag. This package should be stored intact until the part is drawn for use.

5.2.6.6.3.6 Standby Equipment

Equipment that is to remain idle and de-energized for a considerable length of time should have its space heaters turned ON to keep the insulation and equipment dry. If space heaters are not provided for the equipment, appropriate measures should be taken to ensure that proper climatic conditions are maintained.

5.2.6.6.3.7 Vibration

Vibration effects are directly related to the resonant mechanical frequency of the equipment concerned. Vibration caused by loose parts or relative motion between parts can produce objectionable operating conditions such as noise, intermittent circuit malfunctions, short circuits, component electrical overload or burnout, and equipment failure. Mechanical shock can result in damage to, or de-tuning of, electronic equipment.

In order to minimize the detrimental effects of shock or vibration, shock-mounts and anti-vibration devices are employed in equipment installations to isolate the equipment. Shock-mount and anti-vibration devices are relatively simple in their design and construction and require little maintenance; therefore, it is impractical to provide a rigid schedule of inspections and tests. However, certain general precautions must be observed to ensure that the mounting clips, shock-mounts, ground straps, and associated hardware are secured, and in place.

Continued on next page

5.2.6.6.3.7 Vibration, Continued

Precautions must be taken to ensure that paint, oil, solvents, and other types of organic material are not applied to or allowed to come in contact with the resilient surface of a shock-mount. This will result in loss of resiliency, deterioration, and premature failure of the resilient member of the shock-mount.

Keep all fastening devices, such as threaded bolts, nuts, screws, studs, and thread-locking devices secure and in place.
Do not install a rigid connection between the foundation and the framework of equipment that is supported by a shock mount. Such a connection destroys the effectiveness of the mount and may result in serious damage to the equipment mounted on it.

5.2.6.6.4 Antennas and Transmission Lines

5.2.6.6.4.1 Overview

The radio frequency that is generated by the transmitter serves a useful purpose only when it is radiated into space in the form of electromagnetic energy. The antenna, as the interface between the transmitter and free space, is required to convert the power from the transmitter into electromagnetic energy as efficiently as possible and to direct this energy where it will be useful. The degree to which the input power is converted to useful radiated energy is the figure of merit or efficiency of the antenna. Since antennas are used both for transmitting and receiving, the various properties of individual antennas apply to both modes of operation. It is apparent that the antenna is a major element of transmitting/receiving systems and maintenance must not be overlooked. All precautions described in chapter 2 pertaining to men aloft, and minimum safe distances from antennas shall be observed.

5.2.6.6.4.2 Wire Antennas

Most wire transmitting antennas are constructed of phosphor-bronze tiller rope or 7 or 9 strand phosphor-bronze antenna wire. Receiving antennas are generally of 7-16 or 7-18 phosphor-bronze antenna wire. In both cases, construction generally involves the use of bronze clamps and lugs. This section cover the minimum maintenance for such antennas:

?? Maintenance personnel shall, at the end of each extended Period at sea, inspect all antennas for signs of corrosion, fraying, or other damage. Lugs and clamps, which are held together with bolts, etc., should be disassembled, cleaned with sandpaper and carefully reassembled. After such lugs and clamps are reassembled (and just prior to hoisting back into place), they should receive a very thin coating of high-dielectric insulation compound (Dow-Corning Compound). This should not be excessive, as salt and soot will stick to it creating a path for RF arcs. It should not be used on “contact surfaces” of lugs and other points where electrical continuity is necessary.

5.2.6.6.4.2 Wire Antennas, Continued

- Insulators shall be thoroughly cleaned when the antenna is serviced. The bronze ends shall be wire brushed, all foreign material removed from the insulating portion and the entire insulator given a light coating of dielectric insulating compound (Dow-Corning Compound). When applying Dow Corning, squeeze a small amount in the palm and using both hands, spread the compound evenly over the entire insulator surface. Then, using a soft cloth, wipe off as much compound as possible. When it is time for servicing again, the insulator can be wiped off and re-coated with compound. The coating of compound makes removal of salt and soot deposits relatively easy. All insulators, mechanical contact points, washers, feed through bolts, bonding straps, lugs, etc., must be thoroughly cleaned.
- Do not wire brush antennas with polyethylene or other Protective coatings.

5.2.6.6.4.3 Whip Antennas

Whip antennas should be removed and cleaned of all foreign material and corrosion. The base insulator, mounting, and connections, including associated lead-in insulator, should be cleaned. A thin coating of dielectric sealing compound on the insulator and around the antenna to lead-in connections (after they are connected) will be a great aid in future servicing.

5.2.6.6.4.4 VHF/UHF Antennas

Great care must be observed in performing maintenance on these antennas. Due to their high operating frequency, they are small and their construction makes them fragile. Also, due to their high operating frequency, their D.C. resistance is near zero, therefore megger testing is impractical and inconclusive. Refer to technical manuals or contact the MLC/district or equipment manufacturer for information and assistance.

Aside from actual damage, the most common fault in antenna systems is low resistance to ground. Moisture in trunks or coax, dirty insulators, and coaxial cable dielectric breakdown all cause varying degrees of shunting resistance and must be guarded against if maximum system efficiency is to be expected.

5.2.6.6.4.5 Testing Antennas

Testing antennas and transmission lines shall be accomplished periodically as follows:

- ?? Ships: Monthly or at the end of each extended period at sea.
- ?? Shore Stations: Quarterly or more often, as local environment dictates.

The most convenient test of an antenna system is by means of a high-voltage, high-resistance ohmmeter (megger). The megger is the most satisfactory instrument for testing these systems, due to the high voltage that is generated (approximately 500 volts D.C.). This high voltage is sufficient in many cases to break down faults in the insulation (thus causing conduction), thereby exposing any weak spots in the insulation.

5.2.6.6.4.6 Testing Procedures

Before testing, all equipment should be disconnected from the antenna and transmission line. This includes the coupler. The voltage developed by the megger is sufficient to cause circuit damage in equipment left connected. Also, a true reading of the antenna/transmission line cannot be obtained when equipment is left connected due to the circuits providing a path to ground. After isolating the antenna and transmission line from all equipment, connect the megger ground lead to ground or the shield of the transmission line and the hot lead to the antenna connection or the transmission line center conductor. Antennas and transmission lines should be megged separately and separate Megger Cards should be maintained for all antennas and transmission lines. The reading obtained on the megger should be recorded on the Megger Test Record Card, Form NAVSHIP 531. The Megger Card is a continuous record of antenna or transmission line condition and, when properly filled out, will provide an indication of condition changes.

NOTE:

Some whip antennas may contain discrete components or exhibit the characteristics of an electrical short and should not be tested by this method. Equipment technical manuals should be used for additional information.

5.2.6.6.4.7 Antenna Testing Results

A resistance of 200 megohms or less indicates a need for maintenance (clean insulators, check for bad connectors, etc.). A reading of 5 megohms or less indicates an immediate and urgent need to find and correct the cause of the low reading. It should be borne in mind that the above figures are given for information only and maintenance technicians should familiarize themselves with the expected readings for their individual antenna/transmission line systems and, using the megger cards, look for slowly deteriorating readings and/or sudden changes. A note should be made in the remarks block of the card each time work is done to correct a low reading indicating what caused/corrected the problem.

5.2.6.6.4.8 Wave-guides

The type of transmission line normally used with radar is the wave-guide. A wave-guide is actually a form of tuned transmission line and resembles a hollow rectangular or circular pipe. The dimensions of the wave-guide are determined by the operating frequency, i.e. the higher the frequency, the smaller the dimensions (in the vicinity of 1/14 wavelength thick by 3/14 wavelength wide).

5.2.6.6.4.9 Wave-guide problems

The most common trouble encountered in wave-guides is the presence of dirt, moisture and other foreign matter. Any foreign material inside the wave-guide will upset the line constant and result in a mismatch. In addition to the foreign material just mentioned, scale deposits tend to form within a wave-guide, which is not properly sealed from the weather. Hot spots along a wave-guide run are often a good indication that foreign material in the wave-guide is causing excessive loss of power, which shows up in the form of heat.

5.2.6.6.4.10 VSWR

It is obvious that a megger test of the condition of a wave-guide line is not possible. However, an excellent means of determining wave-guide efficiency is to measure the Voltage Standing-Wave Ratio (VSWR) of the line. Some radar equipments have provisions for making this test and reference should be made to the appropriate equipment technical manual for the method. The optimum standing-wave ratio should be determined for each installation. Periodic measurements should be made and compared with the optimum. Any marked deviation from the optimum should be immediately investigated. In many cases, the simple process of listening along the wave-guide run while the associated equipment is operating will reveal arcing caused by foreign material at that point. If arcing is discovered, the appropriate section(s) of the wave-guide should be disassembled and the foreign material cleaned out IAW appropriate procedures.

5.2.6.6.4.11 Reassembling wave-guides

When reassembling wave-guide sections, care should be taken to insure that all flanges are clean, properly mated and that all gaskets are in place. All bolts must be drawn up snugly and evenly. Wave-guide hangers should exert a firm even pressure on the wave-guide without distorting it and should be padded with sheet lead where the wave-guide is brass. In the case of aluminum wave-guide, the pad should be felt or neoprene rubber.

5.2.6.6.4.12 Dehydrator Plugs

Some wave-guide or associated antennas have dehydrator plugs installed at various points. These plugs contain a moisture absorbing material, usually silica gel, as an indicator. The silica gel is normally bluish in color; when it turns pink, it indicates that it has absorbed too much moisture and should be replaced immediately. All installations should be checked for the presence and condition of these plugs with replacement being made when indicated.

5.2.6.6.4.13 Antenna Removal

Ship's personnel, except under very unusual and urgent circumstances, should not normally attempt removal of large, heavy radar antennas from a vessel. Removal of antenna should be handled only while a vessel is moored. To prevent serious accidents when removing radar antennas, every safety precaution shall be taken. All wave-guides and cables shall be disconnected prior to antenna removal. The open ends of any wave-guide shall be covered with plastic or similar material to prevent the entrance of contaminants. After the antenna is removed, it should be placed either on a vehicle to be moved to its planned destination, or placed on suitable clean material, such as a canvas, to prevent structural damage and internal contamination.

5.2.6.6.4.14 Radar Antenna Painting

On the top of most radar antenna arrays there is a line scribed (etched) into the metal enclosure. This line is provided for "squint angle" considerations when aligning the radar servo system, and is the actual angle at which the main power lobe of the antenna is found. Care should be taken, when painting the antenna, not to completely eradicate this line. Additionally, care must be taken to avoid getting paint on the radar antenna transparent windows.

5.2.6.6.4.15 Wave-guide moisture barriers

There should be a moisture barrier in the wave-guide near the radar R/T unit. This is usually located at the output load side of the bi-directional coupler. This may be a manufactured glass wave-guide window or a locally fabricated teflon moisture barrier. These are usually indexed under wave-guide accessories, wave-guide seals, wave-guide windows, or gas barriers in various manufacturers' catalogs. Physical requirements such as outside and inside dimensions, thickness, mating flange requirements and type of metal used are critical; however, if the correct device is obtained the result is an almost loss less transition (insertion loss is nil).

A less professional but quite effective approach is to locally fabricate a barrier cut from a sheet of Teflon film.F.4.a. Teflon film is satisfactory for this purpose and is available commercially; but, since the quantity required for one X-band barrier is only about two square inches, it can usually be had for the asking from a local base activity or the CG Yard. Once the Teflon is obtained, fabrication is a simple matter of cutting to fit the wave-guide flange where the barrier is to be inserted and punching four holes at the corner to accommodate the flange screws. After installation in the wave-guide, any excess Teflon can be razor trimmed flush with the flange lips. Reflection losses not exceeding 0.1. dB may be experienced. If doubt exists, compare forward and reflected power readings taken before and after installation of the Teflon barrier. The recommended Teflon film is 10 mils thick and meets specification MIL-P-22241A.

5.2.6.6.4.16 Wave-guide Hangars

Hangers should support the wave-guide without distorting its cross section. A brass wave-guide should have a lead sheath between it and its hangers. An aluminum wave-guide should have a felt or neoprene sheath between it and its hangers.

5.2.6.6.4.16 Pressure Type Coaxial Cable

Certain types of hollow, pressure-type coaxial cables are employed in shipboard and shore station equipments. There is usually a dehydrator installed to maintain a constant pressure of dry air on the line, thus keeping out moisture. These dehydrators consist of an air compressor and a drying system whereby dry air is furnished under pressure to the line. An indicator is provided to warn of the presence of moisture. Most lines of this type are designed for a pressure of from 3 to 5 pounds. Constant vigilance must be kept to insure that the line is tight; furthermore, the proper functioning of the dehydrator must be checked regularly. If there are any leaks or if the air is not being properly dried, moisture will form in the line and a great deal of trouble will be encountered in drying it again. If a line of this type will not hold pressure, all joints should be checked with a soap solution. The presence of bubbles will indicate a leak at this point, which should be repaired immediately.

5.2.6.6.4.17 Grounding and Bonding

Grounding and bonding of Coast Guard cutters shall be performed as outlined in the latest revision of MIL-STD-1310 (Shipboard Bonding. Grounding, and Other Techniques for Electromagnetic Compatibility and Safety).

MIL-STD-1310 reduces the requirement for topside bonding on metallic hull surface ships with less than six high frequency (HF) transmitters. This reduction, which deletes all topside bonding not specifically required for personnel safety, applies to all Coast Guard cutters.

5.2.6.6.5 Motors and Generators

5.2.6.6.5.1 Overview

The maintenance of most motors and generators is similar. There is no basic difference for example, in the maintenance of a 1/60 horsepower motor in a tuning assembly and a large 14 horsepower motor. The same applies to generators. The following is a maintenance outline which should be used in conjunction with the technical manual:

5.2.6.6.5.2 Maintenance Procedures

Precautions against moisture, dirt and overloading shall be taken. Particular attention should be paid to the removal of carbon dust. A vacuum cleaner is desirable for this; however, in any case proper precautions must be taken to prevent blowing the carbon dust into the windings. Frequency of cleaning is governed by CGPMS requirements.

Inspect brushes and brush holders frequently. Brushes should move freely in their holders yet make firm, even contact with commutators or slip ring surface.

Spring tension on brushes should be checked frequently.

Brushes should not be allowed to **wear down** to less than half of their normal length or to where brush followers or springs can no longer exert normal pressure. The following procedures should be used in installing new brushes:

- ?? Remove power
- ?? Place new brushes in holders.

When no brush seater is available, remove all power and wrap a single layer of crocus cloth (or fine grit sandpaper) around commutator or slip ring. (Never use emery clothe). Fit the brush in the holder with normal pressure, holding it against the crocus cloth. Rotate the armature by hand in the opposite direction to normal rotation until face of brush conforms to the contour of the commutator or slip ring. Remove crocus clothe and clean away all traces of carbon dust. Reset the brushes and operate the machine under light load to fully seat the brushes.

Continued on next page

5.2.6.6.5.2 Maintenance Procedures, Continued	**Commutator** and slip ring surfaces should be kept free of dirt and grease. A smooth, shiny, chocolate-colored coating on the surface is normal and should not be disturbed. The mica, between segments of the commutator, should be kept properly undercut.
	A periodic check of the insulation resistance of the various **windings** is essential to prolong, trouble-free operation.
	Bearings are a source of trouble. Most bearing failures are due to lack of lubrication or foreign material in the bearings. If any doubt exists as to the condition of a bearing, replace it. Check technical manuals for the proper method and grade of lubricant. In lubricating pressure fittings, remove the bottom drain plug in the base of the bearing housing and apply lubricant through fitting or grease cup. When fresh grease flows out the drain hole, replace the plug. Never force grease into a bearing unless the plug is removed. Bearings of the "sealed" type should be checked periodically. Although it is possible to re-lubricate these, it is not recommended. If any doubt exists, replace the bearing. In the case of sleeve-type bearings found in some small motors, a drop of light machine oil should be Placed in the oil holes periodically. Do not mix dissimilar oils or over lubricate. When removing a bearing, always use a bearing puller of the proper size. Never attempt to pry the bearing off or drive it off with a hammer.
	In **disassembling** a motor or generator, care must be taken not to damage the rotor or bearings. All components should be marked to assure proper reassembly. All couplings must be carefully assembled so that all units are rotating as if on a single shaft in the case of motor-generator sets. Misalignment will cause coupling and bearing failure.
	A **quick check** of the mechanical condition of a motor or generator bearing, is to place the blade end of a long screwdriver against the bearing housing and your ear against the end of the handle. A good bearing should give off a medium-pitched, singing sound while a grinding or thumping noise indicates trouble.

5.2.6.6.5.3 Lead Acid

These batteries have high current capabilities and are used in situations requiring a high current of short duration, such as starting engines for emergency power generators. These batteries normally come under the cognizance of the engineering department. However, in some instances, the electronics technician may be called upon to maintain them. Therefore, he should be aware of certain precautions to be observed while working with, or around these batteries.

5.2.6.6.5.4 General Precautions

?? Keep flames and sparks away from the vicinity of batteries because of the explosive hydrogen gas released during charging.
?? When using tools around batteries, exercise care so as not to short-circuit the terminals.
?? Never open batteries except in well-ventilated spaces and only in extreme emergencies if the room temperature is above 125 degrees F.
?? Keep battery compartment below 95 degrees F.

5.2.6.6.5.5 Ventilation of Storage Batteries

?? Always ventilate a battery compartment, which has been sealed before turning on lights, making or breaking electrical connections or performing work in the compartment.
?? Make certain the ventilating apparatus is operating before starting charge.
?? Stop charge if ventilation is removed.

5.2.6.6.5.6 Charging Storage Batteries

?? Do not repair battery connections while circuit is energized.
?? Turn off charging current before batteries are connected or disconnected on the charging line.
?? Observe polarity in connecting the charger and/or additional batteries in the charging line.
?? Keep electrolyte at the recommended level.
?? Always wear goggles, rubber gloves, and rubber apron when handling acid.
?? Never pour water into the acid. Acid must always be poured slowly into the water.

5.2.6.6.5.6 Handling Battery Acid,

- ?? Guard eyes and skin from splashing acid with protective clothing. If acid should come in contact with the skin or eyes, immediately flush the affected area with large quantities of fresh water, and get medical attention immediately.
- ?? Do not store sulfuric acid where freezing temperatures are possible.

5.2.6.6.5.7 Nickel Cadmium Advantages

The nickel-cadmium battery makes an excellent storage battery due to its many favorable inherent characteristics. It provides a reliable source of power over a wide range of operating environments. Some of these characteristics are:

- ?? Extremely long service life.
- ?? Does not normally exude corrosive fumes.
- ?? Composed of individual replaceable cells.
- ?? Not subject to failure by vibration or severe jolting.
- ?? Can withstand extreme cold temperatures and stand idle for indefinite periods without damage.
- ?? Will maintain a steady output voltage even when discharging at high current rate.

5.2.6.6.5.8 Nickel Cadmium Disadvantages

Some disadvantages of nickel cadmium batteries are that the state of charge cannot be determined by a test of the electrolyte. Neither can the state of charge be determined by voltage test because the voltage remains constant over 90% of the total discharge time. Also, a nickel-cadmium battery must be fully charged before adjusting the electrolyte. Since the state of charge cannot be determined by a check of either the voltage or the electrolyte, the charging input to a completely discharged battery must be monitored in current and time until the ampere-hour capacity of the battery has been reached.

5.2.6.6.5.9 Safety Precautions

Generally the precautions outlined for lead acid batteries apply as well for nickel-cadmium batteries. The electrolyte used in nickel cadmium batteries is potassium hydroxide (KOH), the vapor of which is explosive, and KOH itself is corrosive. Care should be taken to prevent getting KOH on skin, eyes, clothes, and metal. Never wear metal objects (watches, rings, etc.) when servicing nickel-cadmium batteries. These metal items could touch an intercell link of opposite polarity and cause severe burns.

5.2.6.6.5.10 Servicing

There are some things, which should be well understood if optimum performance and maximum life are to be realized from nickel-cadmium batteries.

5.2.6.6.5.11 Low Internal Resistance

These batteries have low internal resistance, and are capable of high discharge rates. Do not short circuit the battery as high temperatures, produced by the heavy current flow, can damage the cells.

5.2.6.6.5.12 Temperature Range

Nickel-cadmium batteries will operate in temperatures ranging from -140 degrees F to +140 degrees F, although some deterioration in characteristics will occur at the temperature extremes. The charging environment should be within the temperature range of +32 degrees F to +113 degrees F as extended overcharging at high and low temperature extremes will adversely affect battery life.

5.2.6.6.5.13 Self-Discharge

Over a period of time, nickel-cadmium batteries will self-discharge. When placing batteries into service, be certain they are fully charged.

5.2.6.6.5.14 Capacity

The state of charge is referred to as capacity. Regular and proper maintenance is essential in maintaining a nickel-cadmium battery at required capacity. The charging rate for a nickel-cadmium battery is C/to, where “C” is the ampere-hour capacity of the battery. This is the recommended constant current charging rate at the ten-hour rate. For example: the charging rate for a 14.0 ampere-hour nickel-cadmium battery or cell would be 0.14 amperes at a maximum voltage of 1.5 volts per cell. A completely discharged battery requires 14 to 16 hours of charging.

5.2.6.6.5.15 Trickle Charge	Nickel-cadmium cells can be "floated" or "trickle-charged" to maintain a fully charged condition in standby, for emergency power applications. The usual trickle-charge rate is C/100 unless the manufacturer recommends otherwise.
5.2.6.6.5.16 Storage	Ni-Cad batteries should be stored in a fully discharged state. Recharging should be done just prior to placing into service. The battery should be in a fully discharged state before charging.
5.2.6.6.5.17 Indiscriminate Usage	Indiscriminate use of the battery such as for maintenance checks or troubleshooting will lower the capacity and increase the possibility of failure.
5.2.6.6.5.18 Separation of Ni-Cad and Lead Acid Batteries	A small amount of acid from a lead acid battery will result in irreversible damage to the nickel-cadmium battery. Separate battery shops should be maintained. A tool used on a lead acid type battery must be considered contaminated.
5.2.6.6.5.19 Cleaning	White powdery deposits are potassium carbonate. Remove these deposits with a clean dry cloth or plastic/nylon brush. NEVER use a wire brush. Clean all deposits from the vent caps to prevent them from becoming plugged. Check all screws and cell links for loose connections, which can cause overheating. Look for cracked cell terminals and cracked cell cases.

5.2.6.6.5.20 Lithium Batteries

Lithium batteries or cells are potential hazards if misused, tampered with before, during or after discharge. Lithium batteries have exploded while rapidly discharging and up to 30 minutes after discharge. Whether fresh or discharged, lithium batteries shall not be pierced, crushed, burned, intentionally dropped, cannibalized, dismantled, modified or otherwise carelessly handled nor shall they be short circuited, charged or used in any other equipment than specified. Lithium cells are considered hazardous material. Detailed storage and disposal instructions are provided in Hazardous Waste Management Manual, COMDTINST M16478.1 (series).

5.2.6.6.6 Soldering

5.2.6.6.6.1 Overview

An appreciable portion of equipment failure(s) can be traced directly to poorly soldered joints. Further, since equipments aboard ship are subject to an unusual amount of vibration and shock, it is imperative that all soldering be done with the utmost care. A good solder joint has the following characteristics: bright appearance, no porosity, good fillet between conductors, strong adherence, and no excess flux or solder.

5.2.6.6.6.2 Soldering Techniques

Solder will melt at temperatures lower than the melting point of either of the base metals. Normally the base metals (pure metals) are tin and lead, which when combined, form the alloy (mixture of metals) solder. Tin melts at 1450 degrees F and lead at 621 degrees F. Solder melts between 361 degrees F and 576 degrees F, depending on lead content. For maximum proficiency at soldering, the technician should be familiar with the following facts:

?? Solder does not melt sharply. It first becomes plastic, then mushy, and finally liquid. Soldering must be done at the liquid stage. It cools in much the same manner; first it gets mushy, then plastic, and finally solid. If the joint is moved during these transition stages, a poor (cold) connection results.

?? The temperature and the time at which solder is kept molten (liquid) are critical factors because molten solder absorbs atmospheric gases. This could result in a high resistance connection. Avoid excessive temperatures and do not keep solder molten any longer than necessary.

?? Flux must be applied to a surface before it becomes hot enough to melt solder. With rosin core solder, flux occurs automatically if the solder is held perpendicular to, and above the joint. Flux will carbonize if excessive temperatures are used, and thus be a hindrance to soldering. Acid core solder should never be used in electronic equipment. Before solder is applied, the surface temperature of parts being soldered must be equal to or above the melting point of the solder. Never apply solder to a surface cooler than the solder.

Continued on next page

5.2.6.6.6.2 Soldering Techniques, Continued

?? Always apply the soldering iron tip to the terminal so that maximum heat will be transferred to the part being soldered and maximum protection will be afforded wire insulation or parts adversely affected by excessive heat. Heat sinks should be used when soldering in delicate circuits such as transistor or printed circuits. The heat sink should be placed between the point being soldered and the heat sensitive part.
  - The iron shall be tilted sufficiently to permit application of the solder to the joint.
  - A small amount of solder applied to the soldering iron tip will facilitate the transfer of heat to the joint.
  - Solder should be applied to the joint when the temperature of the joint will readily melt solder. It should not be melted against soldering iron tip, and then be allowed to flow over the joint.
  - Only a sufficient amount of solder should be applied to form a slight fillet between wire and terminal.

5.2.6.6.6.3 Quality Inspection

Soldering aids or similar tools should not be used to exert force on wires for security testing. The quality of a proper solder connection can be determined by a visual inspection. The practice of bending or pulling wires to ascertain security of the connection can present a serious reliability hazard.
Careful selection of an iron of the correct size, shape, and wattage is a prerequisite to reliable soldering. The size and shape of the iron and tip should permit soldering with maximum ease and with minimum danger of damaging surround areas. The unplated copper tip will produce the best overall results.

5.2.6.6.6.4 Solder Tip Care

For cleaning, copper tips should be dressed smooth with a suitable file. To prevent oxidation, the iron should be unplugged and allowed to cool before filing. After filing, apply solder to the dressed tip as soon as it reaches the minimum temperature required to melt solder. Clean the tip by wiping it on a damp sponge or on other suitable material before each connection is made.

5.2.6.6.6.5 Soldering Safety

Soldering is a safe process, if the hazards associated with soldering are recognized and normal safety precautions are observed. Listed below are some of the precautions that must be observed, in order to prevent injuries to personnel, or damage to equipment:

?? Always assume that a soldering iron that is plugged-in is hot, so as to avoid burns.
?? Never rest a heated iron anywhere but on a metal surface or rack provided for this purpose. Carelessness on your part could result in fire, extensive equipment damage, and serious injuries.
?? Never use an excessive amount of solder, because drippings may cause serious skin or eye burns.
?? Do not sling an iron to remove excess solder. Bits of hot solder that are removed in this manner can cause personal injuries, or may ignite combustible material in the work area.
?? When cleaning an iron with a cloth DO NOT hold the cleaning cloth in your hand. Always place the cloth on a suitable surface and wipe the iron across it.
?? Hold small jobs with pliers, or a holding fixture, NEVER IN YOUR HAND.
?? Do not use an iron with a frayed cord or damaged plug.
?? Do not solder in electronic equipment unless the equipment is de-energized.
?? After completion of task, disconnect the iron, preserve it’s tip and allow it to cool, before stowing it in its assigned storage area.

5.2.6.6.7 Salt Water Immersion

5.2.6.6.7.1 Procedures

We're in a seagoing service, so it's inevitable that some of our equipment will be immersed in salt water. These are the procedures to follow in the event it happens.

?? Dismount the equipment and remove all covers, access and mounting plates, vacuum tubes, fuse cover and fuses, and armatures from dynamotors or motor-generator sets. Disconnect and remove all meters from equipment and cases.

?? Flush all parts of the equipment thoroughly, using warm fresh-water under slight pressure. Do not subject the internal parts of pressure-sealed units to the water treatment without first ascertaining that salt water is present inside the pressure-sealed portion. Place the equipment in a tank and soak it not less than four hours in circulating warm water. If non-circulating, change the water at intervals of one hour. As an added precaution against corrosion, add a minute quantity of potassium dichromate to the fresh water solution in the strength of 1/2 oz. to every 10 gallons of water.

?? Remove the equipment from the water and drain it. Blow out all moisture with low-pressure air and dry it thoroughly for 24 hours at a temperature of approximately 150 degrees F.

?? If storage is required prior to overhaul, spray all exposed metal parts slightly, using light clear oil.

5.2.6.6.7.2 Immediate Treatment

If equipment is treated as outlined above, immediately after immersion, a minimum of replacement parts and overhaul work will be required. It is impractical, however, to attempt to salvage vacuum tubes, meters or externally shielded cables (except plugs, which are removed and included with the equipment being preserved). Power transformers in transmitters, must normally be replaced, even though megger tests after baking may show normally high insulation resistance to ground. Replacement of sockets, relay contacts and such, may be required, particularly if immersion took place before power voltages were removed from the equipment. Glass tubes having their leads coming directly out of the glass envelope without a tube socket will not need to be replaced unless proven defective. On tubes of this type, it is necessary to remove all corrosion from the tube leads. It is possible to salvage cathode-ray tubes by removing the plastic base from the tube, removing all corrosion and salt water and replacing the plastic base.

5.2.6.6.7.3 Prolonged Immersion

If the immersion was for a prolonged Period or if the equipment has not been properly washed and preserved, it is usually found that so much corrosion of the cases and mechanical parts has taken place that it cannot be economically overhauled.

5.2.6.6.8 Cold Weather

5.2.6.6.8.1 Overview

Cold weather is no barrier to operations. However, for operation in moderately cold weather (down to minus 35 degrees F), special problems must be solved. These problems involve icing of antennas and insulators, lubrication, special maintenance procedures, and battery operation. These problems are complicated to an even greater extent when it becomes necessary to operate in extremely cold weather (temperatures below minus 35 degrees F). Advance preparations consist of checking the operation and quantity of equipment on board, checking the adequacy of spare parts and cold weather accessories, and winterizing equipment.

5.2.6.6.8.2 Spare Parts

Spare parts shall be inventoried and brought up to allowances. Additional stocks of high failure rate items shall be procured.

5.2.6.6.8.3 Accessories List

The following is a list of equipment and accessories that may prove useful for cold weather operations. Contact the MLC/district for assistance in obtaining those items deemed necessary.

- Cold weather clothing
- Canopies for protection of personnel working in exposed areas.
- Space heaters.
- Canvas covers for exposed equipment.
- Microphone covers.
- Whisk brooms.
- Wooden mallets.
- Non-metallic scrapers.
- Spare antenna insulators.
- Spare antennas (whips and wire) as required for unit.
- Special cold weather lubricants, as required for equipment.
- Spare batteries.

5.2.6.6.8.4 Cold Temperature Effects

For operation below 0 degrees F, increase the specific gravity of the electrolyte in wet cell batteries to 1260. Batteries with a specific gravity of 114O will freeze at 10 degrees F while those with a specific gravity of 1300 will not freeze until minus 90 degrees F. Batteries in exposed locations which are subject to low temperature shall be kept charged during cold weather, and should, in extremely cold weather, be removed to a warm room, if possible.

5.2.6.6.8.5 Whip Antenna Drainage

Whip antennas should have base drainage holes installed. Accumulated moisture in this type of antenna will cause damage to the antenna when freezing occurs. To overcome this difficulty, a 1/8” hole shall be drilled in the base of each antenna. This hole should penetrate the adapter base at the lowest point. See the EIMB, General Maintenance, NAVSEA SE-OOO-OO-EIM-160.

5.2.6.6.8.6 All Equipment

All equipment shall be winterized. A thorough check shall be made to insure that all available winterizing procedures have been accomplished, i.e., replacement of normal lubricants with cold weather substitutes, and installation/proper operation of space heaters and heating tape.

5.2.6.6.8.7 Inspections

While operating in cold weather areas, all equipment shall be frequently inspected to insure that only a minimum buildup of ice or other hazards occur.

5.2.6.6.8.8 Exposed Antennas

All exposed rotating equipment shall be operated and checked at least once each day, more frequent under extreme conditions. In some cases it will be necessary to have such equipment rotating continuously (radar antennas, etc.). The following checks will be performed on antennas:

?? Amount of icing.
?? Rate of ice build-up.
?? Operation of space heaters.

5.2.6.6.8.9 High Winds	Where high winds prevail, antennas shall be stowed to present the least frontal surface to the wind, when not in use. Exceptions to this general rule are those rotating antennas, which are designed to rotate freely in the wind and seek their own best position.
5.2.6.6.8.10 Condensation	During periods when equipment is not being used, the best means of combating condensation and freezing is to keep tube filaments and space heaters energized.
5.2.6.6.8.11 Cold Start	When lighting off cold equipment, pre-heaters shall be used when available.
5.2.6.6.8.12 Rotation	Rotating antennas, which have been secured, shall be rotated slowly in one direction only for a short period to insure that the mechanical system is operating freely. Sudden speed or direction changes may be injurious to the mechanical system.
5.2.6.6.8.13 De-icing	Antennas and wave-guides must be de-iced carefully. The formation of ice on wire antennas can cause them to break. Light accumulation of ice on wire antennas can be knocked off using bamboo poles. On radar, DF and similar antennas, light accumulation may be scraped off using non-metallic scrapers. Heavy accumulation of ice may be removed by utilizing steam, salt water, hot air jet, etc. After removal of any ice accumulation, the surfaces from which the ice was removed should be coated with light oil or suitable silicone compound to inhibit further ice formation.
5.2.6.6.8.14 Movable Parts	All moving parts must be kept dry to prevent freezing and jamming.
5.2.6.6.8.15 Lubrication	All rotating machinery and gear trains shall be checked at least once each week for proper lubrication.

5.2.6.6.8.16 Blowers	Blowers shall be checked daily to insure proper operation. Intakes shall be inspected to insure that snow and/or ice have not clogged them, restricting the airflow.
5.2.6.6.8.17 Wave-guides	Wave-guides shall be regularly checked to insure that no moisture has entered or accumulated.
5.2.6.6.8.18 Clogged Drainage	Whip antenna base and wave-guide drainage holes shall be inspected daily to insure that they have not become clogged.
5.2.6.6.8.19 Cold to Warm	Equipment that is moved from cold to warm spaces shall be checked for condensation, and baked out to insure that ice will not form when the equipment is moved back to a cold space or area.
5.2.6.6.8.20 Exposed Equipment	Snow proof covers shall protect exposed equipment, when not in use. Whiskbrooms shall be used to brush snow from the covers before removing them from the equipment.
5.2.6.6.8.21 Batteries	Dry batteries shall be thawed at about 27 degrees F for one (1) hour, followed by a second hour at 70 degrees F.
5.2.6.6.8.22 Wet Storage Batteries	Wet storage batteries shall have a gradual warm-up period. Care must be taken that the electrolyte does not freeze.
5.2.6.6.8.23 Microphone and Headsets	Microphones and headsets used in exposed areas shall have nylon or polyethylene covers to prevent the diaphragm from collecting moisture. Cables and cords shall be handled carefully when cold to prevent cracking or breaking of the insulation. Cables should be placed in warm areas for some time prior to use to restore their flexibility.

5.2.6.6.9 Personnel Safety

In addition to strict adherence to all electronics safety precautions outlined in Section 4.1, personal safety must also be observed.

?? **Wear loose clothing.** Tight clothing and footgear can restrict blood circulation inviting frostbite or trench foot.

?? **Wear dry clothing.** Outer layers should be water repellent and impervious to rain, snow, sleet, etc.

?? **Wear several layers of thin clothing.** This permits removal of appropriate amounts of clothing as body heat rises while working.

?? **Avoid overheating.** Excessive sweating dampens clothing resulting in poor insulation. Perspiration cools even more as it evaporates. It is better to work while slightly chilly than while excessively sweaty.

?? **Work in pairs.** Check each other for frost bite frequently, since one can become frostbitten and not realize it. Frostbitten skin is whitish or grayish and the parts feel numb rather than painful.

?? **Wear eye protection.** Sunglasses or goggles with tinted lenses to protect against snow blindness and eyestrain.

?? **Never touch metal objects with bare hands.** Although the metal is apparently dry, bare skin will freeze to very cold metal.

?? **Be very careful when working with fuels and volatile liquids.** Gasoline will flash freeze in a matter of seconds.

?? **Cover your work area.** Use wind shields or screens whenever working on equipment in an exposed area.

?? **Don’t Rush.** Frequent rests, hot drinks and food are necessary for personnel working on equipment in exposed areas.

5.2.7 Engineering Changes

5.2.7.0.1 Policy

Electronics equipment and systems installed on all Coast Guard units, including district offices, MLCs, and Headquarters Units, are essential for the units to meet their communications needs, and operational requirements. Installed electronics equipment must be maintained and supported to ensure its availability to operators. Proposed changes to installed electronic equipment must be carefully evaluated to determine its effect on operational capabilities, on other installed equipment, on weight and moment characteristics, on maintenance resources (people and dollars), and on logistic systems (including inventory control, supply stocking points, and training programs). Therefore, changes to installed electronic equipment must be done in accordance with established guidelines and the referenced publications.

5.2.7.0.2 Scope

Engineering Changes are used by the Coast Guard to administer the configuration management process. Engineering changes are described in detail and developed in accordance with Naval Engineering Manual, Chapter 041, COMDTINST M9000.6 (series). Chapter 041 provides process flow charts of the Platform Engineering Change Process, the System Engineering Change Process (HM&E) and the System Engineering Change Process (ELEX-FIELD CHANGE), as well as the Engineering Change Request (ECR) Form CG5682. A summary of the information contained in the Naval Engineering Manual, COMDTINST M9000.6 (series) is provided below for clarity on the Engineering Change Process. Engineering changes to Navy-owned ordnance equipment (ORDALTs) are promulgated by the Naval Sea System Command and are not within the scope of this chapter. Ordnance Manual, COMDTINST M8000.2 (series), Chapter 4, contains policy and procedures regarding ORDALTs. Engineering Changes to avionics equipment are promulgated by the Aeronautical Engineering Maintenance Management Manual, M13020.1(series).

5.2.7.0.3 Intent of Engineering Changes

Changes to cutters and boats which initially seem to be minor and simple, often accumulate to negatively impact and undermine existing configuration management and logistics support efforts. Due to the high cost of modifying platforms (e.g., material, design, drawings, logistic revisions, documentation, staff and production man hours, etc.), only Engineering Changes necessary to meet operational commitments, to correct crucial safety problems, or which result in significant cost savings are likely to be approved. Additionally, it must be realized that the resources used to accomplish Engineering Changes typically reduce funding available for maintenance. Many change requests have merit, but limited funding and lack of a clear, positive benefit-to-cost ratio across a cutter or boat class may prevent approval.

5.2.7.0.4 Applicability

The procedures set forth in this section apply to all cutters, standard boats, Port Security Units and shore facilities. Standard boats are listed in Table 5.2.7-1. The respective District Commander must approve changes to nonstandard boats. The authority to change barges is delegated to the MLCs who shall administer Barge Engineering Changes.

5.2.7.0.5 Table of Standard Boats

Below is a list of standard boats:

PLATFORM	DESCRIPTION
14’ CBS	Cutter Boat, Small
18’ CBM	Cutter Boat, Medium
22’ CBL	Cutter Boat, Large
25’ TPSB	Transportable Port Security Boat
26’ MSB	Motor Surf Boat, MK V
30’ SRB	Surf Rescue Boat
38’ DPB	Deployable Pursuit Boat
41’ UTB	Utility Boat
44’ MLB	Motor Lifeboat
47’ MLB	Motor Lifeboat
49’ BUSL	Buoy Boat, Stern Loading
55’ ANB	Aids to Navigation Boat

Table 5.2.7-1. List of Standard Boats

5.2.7.0.6 References

a. Naval Engineering Manual, M9000.6(series)
b. Aeronautical Engineering Maintenance Management Manual, M13020.1 (series)

5.2.7.0.7 Contents

This section contains the following topics:

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5.2.7.1 Engineering Change Criteria

5.2.7.1.1 Types of ECRs

There are two types of Engineering Changes:

- Platform Engineering Change
- System Engineering Change

5.2.7.1.2 Platform Engineering Change (PEC)

A modification to a shore unit, cutter or standard boat that meets one of the following criteria:

- Changes in weight or moment, which significantly affect intact or damaged stability. Although each case is unique due to different limiting factors (e.g., hull strength, damaged stability, etc.), changes, which create more than a 0.001-foot change in KG or add/delete more than 1/20 of 1% of the full load displacement (i.e. 112 lbs. per 100 tons of displacement), require a Platform Engineering Change. If in doubt about the effect of the intended weight change, request technical advice from the ELC platform manager or MLC Type Desk.
- Changes to the hull structure, space allocations, watertight integrity, or compartmentalization.
- Changes to cutter or standard boat class mission, shore unit characteristics/capability.
- For standard boats, changes to outfitting requirements specified on approved Allowance Equipage Lists (AEL) and additions of new outfitting items that would be required to be placed on an AEL.

5.2.7.1.3 System Engineering Change (SEC)

An Engineering Change that does not meet the criteria of a Platform Engineering Change and meets one of the following criteria:

- A change to any system, part, component, or subassembly that is documented on an Allowance Parts List (APL).
- A change to an approved system software, fluid, or paint system. Such changes will usually be to improve reliability, maintainability, or operational efficiency of the system or equipment.
- A form, fit, or functional change to equipment, a closure or fitting.
- Damage control classification change.

5.2.7.1.4 Coast Guard Field Change (FC)

A Coast Guard Field Change is a type of System Engineering Change used for the modification of the function, performance, or maintenance procedures of particular equipment by changes to the piece-parts, sub-modules, modules, sub-units, program, or manuals of that electronic equipment. For more information on field changes see Section 5.2.7.8.

5.2.7.2 Engineering Change Process

5.2.7.2.0.1 Engineering Change Process (ECP)

All Engineering Changes shall be initiated through the submission of an Engineering Change Request (ECR) (Form CG5682) and can be found in JetForms filler. If you do not have this form, it can be downloaded at http://www.uscg.mil/hq/g-s/g-si/g-sii/forms/formindx.htm. In the left window, click on Select a Forms Library and Select CG5000. Then scroll down till you can download CG5682. Instructions are included with the form. ECRs may originate at any organizational level. The process is completed in four phases: Concept, Validation, Development, and Deployment. The Validation, Development and Deployment phases differ slightly between the Platform Engineering Change Process, the System Engineering Change Process (HM&E) and the System Engineering Change Process (ELEX-FIELD CHANGE). Figure 5.2.7-1 at the end of this section describes the ECP process.

NOTE:

Configuration Change Forms (OPNAV 4790/CKs) shall not be used as a tool to request Engineering Changes, but should only be used to notify the ELC of the completion of an authorized Field Change or Platform/System Engineering Change that affects the unit's configuration.

5.2.7.2.0.2 Contents

This section contains the following topics:

5.2.7.2.1 PEC/SEC Concept Phase

5.2.7.2.1.1 Field Units and Area/District Staffs

The ECR form may be submitted electronically or on paper. The originator is encouraged to provide as much amplifying detail as possible to assist with the proper evaluation of the request. Group and Area units will submit ECRs to the servicing MLC (v or t) via their chain of command (Group/District Commander), ensuring an information copy is sent to their operational commander (OPCON) if necessary.

5.2.7.2.1.2 MLC Responsibility

MLCs will evaluate each ECR from the perspective of requirements and impact on current operations. The MLC will identify the recommended source of funding, recommend a category and classification, and complete a cost benefit analysis and weight estimate. The MLC will endorse the request on the ECR form and forward to the ELC (01).

5.2.7.2.1.3 Headquarters Unit/Level Organization

Although most ECRs are generated through the MLCs, the Commandant (G-O) facility managers, Commandant (G-A), Commandant (G-SC), ELC, Systems Maintenance Engineering Facilities (SMEFs), Boat Standardization Teams, and other Headquarters unit/level organizations may also submit ECRs. These units/organizations will identify the recommended source of funding, recommend a category and classification, and complete a cost benefit analysis and weight estimate. All ECRs shall be forwarded to the ELC (01). The SMEF follows its internal processes before submitting the ECR package.

5.2.7.2.1.4 Engineering Logistics Center (ELC)

The ELC shall review and categorize all ECRs to determine the appropriate development and approval process. ECRs categorized as Platform Engineering Changes shall be forwarded to Commandant (G-SEN/G-SCE) for Headquarters Configuration Control Board (CCB) review and approval. ECRs categorized as System Engineering Changes to electronic equipment managed by a SMEF or the designated Equipment Manager shall be forwarded to the appropriate facility for review, development, and approval.

5.2.7.2.2 PEC Validation, Development and Deployment Phases

5.2.7.2.2.1 Validation Phase

Commandant (G-SEN) manages the validation of afloat Platform Engineering Changes at Headquarters. Commandant (G-SCE) manages shore side Platform Engineering Changes (i.e., LORSTAs). Commandant (G-SEN/G-SCE) will coordinate with the G-O facility manager from the perspective of requirements and impact on future operations. Resource funding requirements shall be determined and approved during this phase of the process. The Commandant CCB shall document the results of the CCB on the ECR form and forward as appropriate. Although concept approval can be determined from the CCB, funding approval may be delayed for POP, RP, OPSTAGE determinations. Disapproved Platform Engineering Change requests shall be returned to the originator with an info copy to ELC (01) with an explanation of the reason for the disapproval.

NOTE:
ECRs without funding support shall not be approved for development.

5.2.7.2.2.2 Development Phase

During this phase, the Platform Engineering Change is prepared for implementation from the perspective of configuration management, life cycle logistics support and installation. The MLC, ELC or SMEF is primarily responsible for this phase. Platform Engineering Changes for electronic systems under the Commandant (G-SCE) program shall be forwarded to the appropriate SMEF or EM for technical development.

5.2.7.2.2.3 Final Platform Engineering Change Package Approval

The MLCs, Commandant (G-SCE/G-SEN) and associated Commandant (G-O) facility managers shall review the final Platform Engineering Change package for concurrent clearance. For information on how to format the final package see Section 5.2.7.2.4. SMEFs are included for electronics Engineering Changes. Proposed Platform Engineering Changes shall be returned to the Headquarters CCB if the development leads to changes in cost or scope beyond the funding limitation and concept approved by the CCB.

5.2.7.1.14 Deployment Phase

Once concurrent clearance feedback issues are resolved, the ELC shall sign the Platform Engineering Change and distribute it to appropriate commands. The Engineering Change Proposal will be approved for action by the authorized L/CCB. A copy will be forwarded to the ELC and shall be basis for ELC to execute the ECR.

5.2.7.2.3 SEC Validation, Development and Deployment Phases

5.2.7.2.3.1 Validation Phase

The ELC, MLC or SMEF manages this process. If funding is required from headquarters, the ELC/MLC/SMEF shall consult with Headquarters to determine the availability of funding. System Engineering Changes shall be reviewed from the perspective of technical feasibility, life cycle costs, and availability of funding. Disapproved System Engineering Changes shall be returned to the originator with an explanation of the reason for the disapproval. SMEFs/EMs shall send the ELC (01) an info copy of all ECR disapproval notices.

NOTE:
ECRs without funding support shall not be approved for development.

5.2.7.2.3.2 Development Phase

The ELC, MLC or SMEF shall develop all approved System Engineering Changes. These shall be developed, formatted, and approved in the same way as Platform Engineering Changes. (See Section 5.2.7.2.4) System Engineering Changes developed by a SMEF for cutters or standard boats will have a concurrent clearance review limited to the MLCs (v/t) and the ELC. System Engineering Changes developed by a SMEF for shore units will have a concurrent clearance review assigned as appropriate. System Engineering Changes developed by the ELC shall have a concurrent clearance review limited to the MLCs (v/t).

5.2.7.2.3.3 Deployment Phase

Once concurrent clearance feedback issues are resolved, the ELC, MLC or SMEF shall sign the System Engineering Change and distribute it to appropriate commands.

5.2.7.2.4 PEC/SEC Final Package Format

5.2.7.2.4.1 Final PEC/SEC Package Format

A fully developed Platform/System Engineering Change is comprised of a cover sheet [Engineering Change Approval Form (CGHQ 3379)] and sufficient information to directly accomplish the Engineering Change, or to support development of a contract specification. The information required for Platform/System Engineering Changes shall be formatted into the following twenty areas, which reflect the general Engineering Change description, installation specifications, and the Integrated Logistics Support (ILS) elements.

1. Purpose
2. Background
3. References
4. Material Required
5. Equipment Removals/Relocation/Disposal
6. Equipment Installations
7. Quality Control/Quality Assurance
8. Safety
9. Stability Impact
10. Funding Requirements and Sources
11. Parts Support
12. Special Tools/Test Equipment
13. Technical Information
14. Manuals
15. Drawings
16. Preventive Maintenance
17. Training
18. Documentation
19. Reprocurement Data
20. Repair Program

NOTE:

For shipboard Platform Engineering Changes, the weight and moment changes must be computed by the ELC. Shore specific Platform Engineering Changes will be fully developed by the SMEF.

5.2.7.3 Prototypes

5.2.7.3.1 Overview

A prototype is a full-scale installation to evaluate the usefulness and effectiveness of an Engineering Change and/or to develop or modify installation specifications. The Engineering Logistics Center (ELC) or SMEF in the case of shore units shall be the Engineering Change prototype approving authorities. Requests for prototypes should be incorporated into the Engineering Change Request. Upon receipt of the prototype request, ELC or the SMEF shall evaluate the technical impact of the request and, if appropriate and after consultation with the originator, issue a prototype authorization letter to the interested parties. Once the SMEF or EM has authorization for the prototype a Prototype Evaluation Plan will be developed by the SMEF/EM.

5.2.7.3.2 Prototype Evaluation Plan

The unit on which the prototype is installed will complete the PEP and returned it to the ELC with a copy to the SMEF/EM and other activities involved in the prototype (i.e., Commandant (G-O), MLC, etc.). Because prototypes are often an integral part of the Engineering Change development process, it is critical that the PEP be completed and returned.

5.2.7.3.3 Prototype Evaluation Period

Upon completion of evaluation **AND** final PEC/SEC approval, a prototype installation will be upgraded to the final installation configuration if necessary, and will become a permanent installation. Unsuccessful prototypes shall be removed after completion of the evaluation period. The removal shall be funded by the organization that funded the installation.

5.2.7.4 Engineering Change Administration

5.2.7.4.1 Operational Approval of the Engineering Change

All engineering changes must be acceptable to both the program manger responsible for operations, and the support manger responsible for the engineering or technical capabilities. The activity issuing the change is responsible for ensuring both approvals are granted before making the change. Other units or offices intending to implement any change must confirm that the engineering change is authorized. Approving officials shall assist units proposing engineering changes with gathering the needed approvals

After operational approval, a request for engineering approval shall be submitted on the designated form to the appropriate approving authority via the chain of command. Both requests may be submitted simultaneously when time is short, with the understanding that substantial engineering effort may be lost if operational approval is not forthcoming or requires significant changes.

5.2.7.4.2 Engineering Approval of the Engineering Change

Engineering approval is the determination that operational approval has been given or is not needed, and that the effect of a proposed change has been evaluated and is acceptable in terms of:

?? Influence on existing logistics support resources – facilities, manpower, spare parts, maintenance, training, and documentation.
?? Technical feasibility and soundness – engineering approval may include technical guidance or changes to the proposed change.
?? Soundness and feasibility of installation plans and procedures.
?? Relationship to other equipment and systems – includes weight and moment considerations (for vessels), power requirements, interference, interfaces, compatibility, etc.
?? Relationship to other equipment replacement and improvement programs – to ensure that the proposed change is compatible and consistent with other programs which may also affect the equipment or unit to be modified.
?? Budgetary and resource requirements – an identification of the resources required to implement the proposed change and to provide continued logistics support of the modified equipment and units.

5.2.7.4.3 Delegation of Approving Authority

Chief, Office of Naval Engineering (G-SEN) has final Engineering Change Request approval authority for shipboard systems. Chief, Office of Electronics Systems (G-SCE) has final Engineering Change approval authority for electronics Platform Engineering Changes at shore units. This approval authority is generally delegated as outlined in the following paragraphs. Where a proposed system or equipment has significant impact to the engineering and/or logistics support infrastructure and creates organizational or support changes beyond the cognizance of the center of excellence, the final engineering change request shall be forwarded to Commandant (G-SCE/G-SEN) for resolution and approval.

5.2.7.4.4 Commandant (G-SEA)

Chief, Office of Aeronautical Engineering (G-SEA) has final approval authority for Coast Guard Time Compliance Technical Orders (TCTO).

5.2.7.4.5 C2CEN

Commanding Officer, Command & Control Engineering Center (C2CEN), is authorized to approve System Engineering Changes, Field Changes, and Emergency Changes for all shore based systems and equipment under his/her cognizance and is authorized to give electronics engineering approval to Platform and System Engineering changes for all shore sensors and integrated systems for which C2CEN has SMEF responsibility.

5.2.7.4.6 LSU

Commanding Officer, Loran Support Unit (LSU), is authorized to approve System Engineering Changes, Field Changes, and Emergency Changes for all shore based systems and equipment under his/her cognizance and is authorized to give electronics engineering approval to Platform and System Engineering changes for all systems for which LSU has SMEF responsibility.

5.2.7.4.7 TISCOM

Commander, Telecommunications & Information Systems Command (TISCOM), is authorized to approve System Engineering Changes, Field Changes, and Emergency Changes for all shore based systems and equipment under his/her cognizance and is authorized to give electronics engineering approval to Platform and System Engineering changes for all equipment or systems which TISCOM has SMEF responsibility.

5.2.7.4.8 ELC

Commanding Officer, Engineering Logistics Center (ELC), is authorized to approve System Engineering Changes, Field Changes, and Emergency Changes for all systems and equipment under its cognizance and is authorized to give electronics engineering approval to Platform and System Engineering changes for equipment or systems which ELC has engineering responsibility.

5.2.7.4.9 MLC (t)

Chief, Electronics Division, Maintenance and Logistics Command [MLC (t)] is authorized to approve System Engineering Changes in accordance with the following criteria:

?? The alteration provides facility recabling and/or equipment relocations due to building renovation projects.
?? Does not require new installation of, or changes to SMEF, MLC or ELC managed equipment or material, e.g. Appropriations Purchase Account (APA) Turn in Repairables (supply code XB) or other centrally managed or supported equipment.
?? Does not require the use of or will have no effect or change on centralized CG training, supply support, maintenance services or resources.
?? Will not require a Headquarters coordinated procurement or maintenance contract.
?? Can be supported with existing MLC, area or district resources (funds and personnel), including procurement, installation, spares, and repairs. It is the MLC's responsibility to coordinate these resources with the area and districts.

Sum of electronics material and installation costs does not exceed $100,000. Requests for AFC-42 funding must be made in accordance with the provisions of paragraph 5.2.7.5.1.

5.2.7.4.10 SMEF's

Systems Management and Engineering Facilities (SMEF) are authorized to approve Coast Guard Field Changes, which apply to equipment assigned to the SMEF by Commandant (G-SCE). SMEFs shall assign and track Field Change Bulletin numbers by equipment or system. SMEFs must send draft copies of proposed field change bulletins or errata to the Engineering Logistics Center (ELC) to obtain stock numbers, if required.

5.2.7.4.11 Program Manager Authority

The program manager for the units affected is authorized to issue operational approval for all proposed changes or alterations. This approval requires the agreement of Commandant (G-SCT) when a change to the electromagnetic radiation characteristics of the unit results from the change or when telecommunication equipment or services across district lines are affected.

5.2.7.4.12 Temporary Changes

Engineering approval for temporary changes is delegated to the Commanders of MLCs and Commanding Officers of Headquarters Units, consistent with the information presented in this section. Authority to operationally approve temporary changes is delegated to Areas, district commanders and Commanding Officers of Headquarters Units in the following circumstances:

?? Authority to operationally approve temporary changes to internal communications and public address systems for shore units is delegated to Area and District Commanders and Commanding Officers of Headquarters Units.

?? General Purpose Electronic Test Equipment (GPETE) does not require operational approval. This is implicit in the approval of the operational electronics equipment, which it is used to support.

?? Replacement in kind of installation items listed in Enclosure (6) to Telecommunications Plan, COMDTINST M2000.4 (series) or transfer of authorized equipment between units to meet operational commitments do not require further operational approval.

?? As SMEF's are established, authority is delegated to them for management of specific equipment, including changes, installations, etc., as set forth in this section.

5.2.7.5 Funding

5.2.7.5.1 Funding

Funding for engineering changes will be determined through the ECR process as outlined in this chapter. It is anticipated that funding will come from one of three major sources. Refer to the following table.

Funding Source	Low Cost	Medium Cost	High Cost
Unit AFC 30	X		
MLC AFC 4X		X	
Program Manager (3X/4X/A&I)			X

Table 5.2.7-2 Funding Source

5.2.7.5.2 Engineering Change Cost Definitions

Low cost engineering changes are those changes which have a total cost (including design, material, and installation) less than or equal to the MLC established AFC 30 CSMP funding threshold for the particular cutter class.

Medium cost engineering changes are those changes, which have a total cost (including design, material, and installation) greater than the MLC established AFC 30 CSMP funding threshold but not to exceed 5% of the affected cutter class annual AFC 45 standard support level (SSL).

High cost engineering changes are those changes which have a total cost(including design, material, and installation) greater than 5% of the affected cutter class annual AFC 45 standard support level (SSL). AC&I threshold levels are listed in the Financial Resource Management Manual (FRMM), COMDTINST M7100.3 (series).

5.2.7.6 Engineering Change Tracking, Numbering and Classification

5.2.7.6.1 Tracking Case Files

The ELC shall maintain an ECR database that tracks the status of all ECRs. In order for the ELC to keep this database complete and accurate, ECR status information shall be submitted to the ELC as described in COMDTINST M9000.6 (series). The database shall be maintained and be available on the ELC's intranet site (**http://cgweb.elcbalt.uscg.mil**). Until all units have intranet access, specific unit queries shall be forwarded to the appropriate MLC. The database shall include the following information:

?? ELC Case File Number/Tracking Number
?? Originator
?? Title
?? Date Submitted by Originator
?? Prototype Status (as applicable): Unit/date installed, due & receipt dates for prototype evaluation results.
?? Engineering Change Development Plan (HM&E only)
?? Comments

5.2.7.6.2 Numbering

Engineering Changes shall be numbered using three groups of letters and numbers. The first group defines the cutter or boat class to which the Engineering Change is applicable. The second group defines the classification of the Engineering Change. The third group is the serial number of the Engineering Change for the particular cutter or boat class (e.g., 110A-B-010, 41UTB-A-005). The ELC shall issue all Engineering Change numbers.

NOTE:

This is the same system used for the old Ship and Boat Alteration system. Serial numbers have been carried forward from that system.

5.2.7.6 Engineering Change Tracking, Numbering and Classification, Continued

5.2.7.6.3 Classifications

Commandant (G-SEN) shall classify platform Engineering Changes. System Engineering Changes shall be classified by the ELC or SMEF. There are three types of classification shown in the table below:

Classification	Description
A	Class A Engineering Changes are of the utmost importance for correcting conditions that impair the service characteristics of a cutter, its safety, or the health of its personnel. Class A Engineering Changes shall be considered to be equivalent to urgent repairs and shall be accomplished at the first opportunity, but in no case later than one full availability cycle after the Engineering Change is issued.
B	Class B Engineering Changes are less urgent than Class A Engineering Changes, out are of importance by reason of the resultant improvement in the service characteristics of the cutter, the health and comfort of its personnel, or notable improvements in efficiency and economy of operations and upkeep. Class B Engineering Changes shall be accomplished within two availability cycles from the time the Engineering Change is issued.
C	Class C Engineering Changes are to be accomplished upon the occurrence of a specific event (e.g., contingent upon receipt of Commandant funding or upon the need to renew a specific item). This class of change describes a future configuration such as the use of an improved joiner bulkhead panel or renewal of a reliable but obsolete pump. These changes are either impossible or undesirable to accomplish quickly on all vessels of a class. Delay in accomplishing this class of Engineering Change will not impact operational capability. The Engineering Change will identify the contingency. Once the contingent aspect of the Engineering Change has occurred, the Engineering Change becomes mandatory and must be completed within two years.

Table 5.2.7-3 Classification of EC's

5.2.7.7 Reports and Records

5.2.7.7.1 Report of Completion

Upon completion of an Engineering Change, the unit shall fill in the completion section of the Engineering Change Authorization Form (CGHQ 3379) and forward two signed copies, one to the ELC and one to the servicing MLC. The unit will also retain a copy in their files. If the Engineering Change pertains to an electronic system, a copy shall also be a. forwarded to Commandant (G-SCE). Units which are MICA/CALMS supported shall also submit a Configuration Change Form (OPNAV 4790/CK) when directed to do so by the Engineering Change. This form can be downloaded from the ELC(01) website, http://cgweb.elcbalt.uscg.mil/ccf-form.htm. A unit that receives a class related Engineering Change that does not apply to their particular boat/cutter/unit shall note the same in the completion section of the form and send the signed copies as noted above.

5.2.7.7.2 Unit Records Responsibility

Each unit shall maintain a file of pending and completed Engineering Changes as part of the general engineering files, in accordance with Chapter 090 of Naval Engineering Manual, COMDTINST M9000.6 (series). Appropriate entries shall be made in the Machinery History, Hull History, etc. Vessels with CMPlus will update the database in accordance with the CMPlus user's guide to reflect completion of Engineering Changes.

5.2.7.7.3 ELC Records Responsibility

The ELC shall maintain the master Engineering Change file for all cutter and boat classes. This file will contain the original signed copies of each Engineering Change issued. The ELC shall also maintain a case file for each Engineering Change proposal. This file shall be a historical repository of all relevant documents associated with the Engineering Change issue.

5.2.7.8 Testing of Commercial Products

5.2.7.8.1 Unsolicited Proposals	Manufacturer's agents often approach field commands to propose tests and trials of new products or equipment. While Coast Guard policy is to continually seek improvements, vendors seeking to field test unproven products or to generate product endorsements shall not use cutters, boats and units indiscriminately. Coast Guard Acquisition Procedures (CGAP), COMDTINST M4200.19 (series) provides guidance for processing and handling unsolicited proposals.
5.2.7.8.2 New Products Or Equipment	Coast Guard initiated proposals for testing proprietary products or materials shall be processed using the same procedures detailed for the Engineering Change Process described in this section.

5.2.7.9 Field Changes

5.2.7.9.1 Purpose

A field change is a modification to a specific type of electronic equipment and will be installed in all Coast Guard equipment of that specific type. Any exceptions will be specified by equipment serial number, location, or use, in the field change bulletin. Field changes are issued to modify electronic equipment to meet a change in operational requirements, remove hazards, correct design deficiencies, improve reliability and maintainability, and correct technical documentation. Technical manuals and formal operating and maintenance instructions are treated as an inherent part of the equipment for field change purposes.

5.2.7.9.2 Responsibilities

The Coast Guard Field Change Bulletin is the document used as authority for installation of field changes. The Systems Management and Engineering Facility (SMEF), or designated Equipment Manager (EM), in the absence of a SMEF, having cognizance over the subject equipment approves the Coast Guard Field Change. Commandant (G-SCE) is responsible for designating Equipment Managers for electronic equipment not supported by a SMEF. (The designated EM can be the ELC, MLC, C2CEN, TISCOM, or LSU.) [*This designation responsibility has not yet been established by Commandant (G-SCE)*] Each SMEF or EM shall assign field change numbers and coordinate stock numbers with the ELC.

5.2.7.9.3 Unit Responsibility

It is the responsibility of the individual operating unit to assure that all applicable field changes have been installed in their equipment. For units not having technicians assigned, the supporting maintenance facility has the responsibility for insuring that all applicable field changes are installed. Each equipment that has an applicable field change should be physically checked, using the identification paragraph of the field change bulletin and the "Field Change Accomplished" plate, to ensure that the field change has actually been installed. Applicability of Coast Guard field changes may be verified in the CGPMS Work Schedule Book.

5.2.7.9 Field Changes, Continued

5.2.7.9.4 Emergency and Urgent Alterations

All authorized engineering changes to installed equipment are documented by field changes. Operational requirements may necessitate emergency alteration of equipment. An *emergency* priority is assigned to field changes to effect a change in operational characteristics, which, if not accomplished may seriously compromise national security or to correct an extremely hazardous condition, which may result in fatal or serious injury to personnel, or extensive damage or destruction of the equipment. Under such conditions the change to equipment shall be reported **immediately**. In urgent situations the equipment alteration may be authorized by an ALDIST or SMEF advisory for SMEF equipment and later confirmed with a field change. An *urgent* priority is assigned to field changes for one or more of the following:

- ?? To effect a change in operational characteristics, which if not accomplished may seriously compromise the mission effectiveness of the deployed equipment or forces.
- ?? To correct a potentially hazardous condition, which may result in serious injury to personnel or damage to the equipment.
- ?? To conform to significant contractual requirements (that is, when lead time will necessitate slipping approved production, activation, or construction schedules if the changes are not incorporated).
- ?? To effect through value engineering or other cost reduction efforts, net life cycle savings to the government of more than $100,000, where expedited processing of the change will be a major factor in realizing lower costs.

5.2.7.9.5 Confusion with Maintenance Hints

Maintenance hints are not to be confused with field changes. A field change involves the changing of components, physical alteration of cabinets or housing, changing of operational tolerances or capabilities and changes to the technical manuals. In contrast, a maintenance hint involves procedures not formerly documented that are useful in servicing electronic equipment. For example, a maintenance hint may involve a revised method for disassembly and re-assembly of a complicated servomechanism that simplifies the procedure or decreases the time involved.

5.2.7.9.6 Confusion with Depot Changes

A Depot Change is not a field change because it is performed at a designated depot level maintenance facility. It is, however, a modification to modules, subassemblies, or equipment that have been designated as depot level repairable. A modified module may be electrically, physically, functionally, and pin-for-pin interchangeable with the unmodified module, in which case, it is simply returned to the supply pipeline upon modification. However, when a "Depot Changed" module or equipment is not directly interchangeable and requires mainframe wiring or component changes, it may be provided as part of a Type 1 or Type 3 field change.

5.2.7.9.7 Format Standardization

The Coast Guard uses field changes as generated by the Navy. In order to standardize the format, Coast Guard field changes are used to promulgate Army, Air Force and commercial modification changes.

5.2.7.9.8 Type Designations

The Type designations used on Coast Guard field changes indicate the extent to which parts are furnished and may indicate technical manual corrections. Each type is defined below:

Type	Designation
1	Furnishes documentation, parts, and special tools required to complete a change. Documentation, parts and tools are assembled and supplied as a field change parts kit, which is assigned a stock number. This type change involves alterations to equipment and requires changes to the technical documentation.
2	Furnishes documentation only. The installing unit from an appropriate supply source procures required parts or special tools. The installing unit provides the funds for the parts or tools. This type change requires alterations to the equipment and also requires changes to the technical documentation.
3	A Type 3 field change furnishes documentation and some of the parts or special tools, which are required. The remainder of the required parts or special tools is procured from a specified source by the installing unit. This type of field change requires alteration to the equipment and requires corresponding changes to the technical documentation.
4	A Type 4 field change implements changes to technical documentation only and requires no alterations to the equipment.

Table 5.2.7-4 Types of Field Changes

5.2.7.9.9 Field Change Package

A complete field change package consists of the field change bulletin and a field change parts kit, which are described, in following paragraphs. Field change parts kits are not required for Type 2 and Type 4 field changes.

5.2.7.9.10 Field Change Bulletin

The field change bulletin is the authority for the installation of the field change. The field change bulletin is organized into the following sections:

- Purpose
- Description
- Equipment Affected
- Identification of Accomplishment
- Materials Required
- Tools Required
- Test Equipment Required
- Procedure
- Routine Instructions

The necessary documentation for implementing a field change is contained as part of the field change bulletin. This includes corrections to technical documentation, parts lists, step-by-step installation procedures, and an OPNAV 4790/CK Configuration Change Form. These items are included in the field change bulletin to clearly outline the field change to equipment managers and support personnel involved in coordinating installation and support of field changes. All field change bulletins must contain distribution directions, especially in the case of ESU/ESD/ATON servicing units, and, if applicable, a stock number for the bulletin and the field change parts kit. An example of a field change bulletin is shown in Example 5.2.7-1. The equipment or system SMEF is solely responsible for obtaining stock numbers from ELC as necessary. Field change bulletins are distributed to all activities that have an interest in equipment modifications. For example, MLC and district commanders receive bulletins but not the parts kit unless the equipment is installed at the MLC or district office.

5.2.7.9.11 Field Change Parts Kit	A field change parts kit consists of the parts, special tools, related parts lists and installation procedures that are furnished for a field change. A copy of the field change bulletin should also be included in the kit. Parts kits are only included in Type 1 and Type 3 field changes. Procurement information must be included in the field change bulletin under the Material Required section in order for the unit to obtain the proper parts. These kits are distributed by the Engineering Logistics Center, SMEF, or requisitioned by the unit from the supply source as indicated in the field change bulletin.
5.2.7.9.12 Errata Sheet	If relatively minor mistakes have been made in the field change bulletin, an ERRATA sheet will be issued to correct these errors (Example 5.2.7-2). The Errata Sheet receives the same distribution as the related field change.
5.2.7.9.13 Numbering Coast Guard Field Changes	The SMEF has responsibility for assigning numbers for Coast Guard electronic field changes applicable to its assigned equipment or systems. SMEF is also responsible for obtaining field change stock numbers from the ELC.
5.2.7.9.14 Numbering Field Changes on Navy Equipment	Navy field changes are numbered consecutively starting with number one, Coast Guard changes for Navy equipment are numbered consecutively starting with the number 91 to distinguish between the two sources. Therefore, it is possible to have field changes 1, 2, 3, 4, and 5 (Navy) and field changes 91, 92, and 93 (Coast Guard) installed in Navy type equipment.

5.2.7.9.15 Receipt, Storage and Issue of Field Changes Using the Engineering Logistics Center

If field change parts kits fabricated by the Coast Guard are not distributed by the Commandant or SMEF, the field change may be put into a Headquarters Office/Headquarters Unit (HQO/HQU) Materiel Management Project at the Engineering Logistics Center (Code 031). Headquarters Materiel Management Projects at the Engineering Logistics Center, COMDTINST M4000.13 (series) provides direction for establishing, maintaining and closing a HQO/HQU Materiel Management Project. Additional field change parts kits may be stored in the project for a limited time to ensure that necessary units have received the parts kits and bulletin to install in the applicable equipment. This will require that Activity Control Numbers be assigned to the parts kits/bulletin. Requests to assign a stock number for a field change bulletin will be accepted only from assigned SMEFs. Bulletins will be available on the applicable SMEF's Intranet Web Site.

5.2.7.9.16 Trial Installation

Although the System Management issues Coast Guard field changes and Engineering Facility (SMEF), except those authorized to be issued by MLC, the information necessary to implement a field change must come from all levels of command. Wherever possible, a trial installation is made for evaluation prior to service wide distribution of a field change. SMEFs must send draft copies of proposed field change bulletins or errata to the Engineering Logistics Center if an Activity Control Number is required.

5.2.7.10 Field Changes From Other Sources

5.2.7.10.1 Authorization Policy

The intent of this section is to provide information on field changes by other services, which are applicable and approved for electronics equipment in the Coast Guard. As a rule, field changes generated by other agencies are authorized for those agencies equipment, which are used by the Coast Guard.

5.2.7.10.2 Navy Field Changes

Since the Coast Guard and the Navy share much in common as a sea-going service, the Coast Guard capitalizes on the availability of Navy equipment. It is imperative that the Coast Guard keep abreast of Navy field changes to maintain compatibility of all Navy Type equipment, whether Navy owned or Coast Guard owned. Field changes for Navy Type equipment are promulgated by the Navy In-Service Engineering Agent (ISEA) (the Navy ISEA has similar functionality to a Coast Guard SMEF) and are sent to registered users of the Ship Configuration and Logistics Support Information System (SCLSIS) database. Coast Guard units are authorized to install Navy field changes to the appropriate equipment upon receipt of the field change. Field changes outside the ability of the servicing technicians shall be completed by the appropriate Systems Command (SYSCOM) (i.e., SPAWAR, NAVAIR, NAVSEA) Groom Team on their next scheduled visit. Upon installation of the field change, an OPNAV 4790/CK Configuration Change Form must be submitted to ELC (Code 016). Questions concerning Navy Type field changes may be addressed to either the ELC (Code 016) or Commandant (G-SCE-2).

5.2.7.10.3 Commercial Field Changes

When a manufacturer issues a change bulletin to commercial electronic equipment used by the Coast Guard, the bulletin is screened by the SMEF for applicability. A field change bulletin is then issued by the SMEF, informing Coast Guard operating units that a particular change is applicable to their equipment. Any unit receiving information concerning a change to commercial equipment, not previously published or authorized, shall forward the information to the appropriate SMEF via their respective MLC (t). Under no circumstances will a commercial field change be installed until authorized by the Commandant (HQ and HQ Units, SMEFs, MLCs) and a field change package prepared and distributed.

5.2.7.11 Reports and Forms Associated with Field Changes

5.2.7.11.1 Field Change Accomplishment Plate

A Field Change Accomplishment Plate shall be affixed, in a visible location, to all electronic equipment. Record completion of all field changes on the Field Change Accomplishment Plate. These plates are available from NPFC, Philadelphia under NSN 0264-LP-456-6411.

5.2.7.11.2 CMPlus Entries

Those units having and using CMPlus (any version) must enter completed field changes into the unit configuration management database.

5.2.7.11.3 OPNAV 4790/CK Configuration Change Form

For any configuration change, [installation, de-installation, modification (field change)], an OPNAV 4790/CK Configuration Change Form is required to be submitted to the Configuration Data Manager at:

Engineering Logistics Center (Code 016)
707 Ordinance Road
Baltimore, MD 21226

This form can be downloaded from the ELC (01) website, http://cgweb.elcbalt.uscg.mil/ccf-form.htm.

ELECTRONIC FIELD CHANGE BULLETIN

F. C. NO. 19 TYPE 1 TO AN/FPN-64A(V) LORAN-C TRANSMITTER SET

PURPOSE:

This field change reduces the off-air time when switching output/coupling networks in the AN/FPN-64(V) and AN/FPN-64A(V) LORAN-C Transmitter Sets.

DESCRIPTION:

This field change modifies the 2A1A2A1A7 RF Switch Control PCB to reduce the off-air time to 15 seconds when switching output/coupling networks. This field change also provides corrections to the technical manual to document the changes to the RF Switch Control PCB.

EQUIPMENT AFFECTED:

This field change is applicable to all AN/FPN-64(V), and AN/FPN-64A(V) LORAN-C Transmitter Sets.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of 510 k ohm resistors for R20 and R35 on the 2A1A2A1A7 RF Switch Control PCB identifies accomplishment of this field change.

MATERIALS REQUIRED:

RF Switch Control PCB, NSN XB 5998-01-068-5615, modified by Depot Change 03 (orange stripe on the edge of the circuit card).

TOOLS REQUIRED:

None.

PROCEDURE:

1. Follow the step-by-step installation instructions in enclosure (1).

2. Perform the technical manual corrections in enclosure (2).

Example 5.2.7-1

3. Complete and return the Field Change Installation Feedback Report provided as enclosure (3).

<u>ROUTINE INSTRUCTIONS</u>:

1. Record completion of this field change by making an entry on the Field Change Accomplishment Plate, NSN OI 0264-LP-456-6411, available from the Naval Publications and Forms Center, Philadelphia, PA.
2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Engineering Logistics Center, Baltimore, MD. Order directly at no cost using MILSTRIP procedures; NSN CG 7610-01-GE8-6673 applies.
3. Upon completion, a copy of this field change bulletin shall be inserted in front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that applicable technical manual annotations and reports have been made.

C. A. SCHUE, III

Encl: (1) Installation Instructions for FC 22/19 to the AN/FPN-64(V)/64A(V)
(2) Technical Manual Corrections for FC 22/19 to the AN/FPN-64(V)/64A(V)
(3) Field Change Installation Feedback Report

Installation Instructions for FC 22/19 to the AN/FPN-64(V)/64A(V)

SAFETY NOTE

COMPLY WITH U.S. COAST GUARD SAFETY PRECAUTIONS AND THE ELECTRONICS MANUAL, COMDTINST M10550.25A

NOTE: Read all instructions before attempting to complete this field change.

1. Order three modified RF Switch Control PCBs, NSN XB 5998-01-068-5615 (one for the installed TOPCO, one for the spare TOPCO, and one for a MICA spare), and using normal APA requisitioning procedures. Once received, proceed to step 2.

2. Notify the control station that this field change is being installed and might cause a MOA when power is secured and reapplied to the TOPCO.

3. Place the MANUAL/AUTO switch on the PPU A11 Panel to MANUAL.

4. Secure power to the TOPCO by turning off CB1 (battery) and CB2 (AC) on the rear of the unit.

5. Open the TOPCO and locate the RF Switch Control PCB (green card extractor).

6. Remove the existing RF Switch Control PCB.

7. Insert the modified RF Switch Control PCB and close the TOPCO.

8. Return power to the TOPCO, by turning on CB2 (AC) and CB1 (battery) on the rear of the unit.

9. Place the MANUAL/AUTO switch on the PPU A11 Panel to AUTO.

10. Notify the control station that you will be switching output/coupling networks twice to test the new RF Switch Control PCB.

11. Switch output/coupling networks by pressing the COMMAND button on the TOPCO. Note how long the station is off air. It should be off air for approximately 15 seconds.

12. Switch output/coupling networks again by pressing the COMMAND button on the TOPCO. Note how long the station is off air. It should be off air for approximately 15 seconds.

13. Notify the control station that the installation is complete.

14. Return all unmodified RF Switch Control PCBs to ELC using normal procedures for returning defective XB items. On the "Serviceable/Unserviceable Material Tag" for trouble indication write "Requires most recent depot change".

Technical Manual Corrections for FC 22/19 to the AN/FPN-64(V)/64A(V)

1. Make the following pen and ink corrections to the AN/FPN-64(V)/64A(V)Technical Manuals. Write "FC 22/19 to the AN/FPN-64(V)/64A(V)" at the bottom of each corrected page.
   a. Page 2-19, Table 2-2, Item 38, line 6, in the Function column, change 20 seconds to 15 seconds.
   b. Page 3-125, Figure 3-45, change both 20-Sec One-Shot to 15-Sec One-Shot.
   c. Page 3-126, Paragraph 3-222, 5th and 9th lines, change 20-sec to 15-sec.
   d. Page 3-126, Paragraph 3-223, 1st and 5th lines, change 20-sec to 15-sec.
   e. Page 3-186, Paragraph 3-355, sub-paragraph 1, 2nd line, change 20 sec nominal to 15 sec nominal.
   f. Page 3-189, Paragraph 3-360, sub-paragraph 7, change 20-sec to 15-sec.
   g. Page 3-189, Paragraph 3-360, sub-paragraph 8, change 20-sec to 15-sec.

2. Make the following page change:

REMOVE	**INSERT**
Page 5-121 (Original)	Page 5-121 (FC 22/19)

ERRATA SHEET NO. 1
TO
F. C. NO. 19 TYPE 1 TO AN/FPN-64A(V) LORAN-C TRANSMITTER SET

PURPOSE:

This errata is being released to ensure timely modifications to the RF Switch Control PCBs and increase the number of spares in the pipeline. This errata modifies the installation instructions and provides resistors to accomplish this field change. Normally field units would not work on XB modules; however, the LORSTAs and the ELC repair depot would benefit from this, enabling the LORSTAs to accomplish this field change quickly and ensuring that adequate spare PCBs remain in stock.

LORSTAs that have ordered, but have not received the RF Switch Control PCBs, should cancel their orders. If modified PCBs have been received, verify that they function properly and install them in accordance with the original installation instructions in Field Change 22/19 to the AN/FPN-64(V)/64A(V). If the modified boards do not function properly, return them to ELC for repair.

PROCEDURE:

A qualified Electronics Technician shall perform the following procedure on each RF Switch Control PCB, using the proper soldering tools and techniques:

1. Identify the resistors to be replaced; R20 and R35, on the MICA spare RF Switch Control PCB.

2. De-solder and remove R20 and R35. Be very careful not to damage the circuit runs or eyelets.

3. Insert the new 510k-ohm resistors (provided by LSU) in the now vacant R20 and R35 locations.

4. Solder the new resistors in place, again being careful not to damage the circuit runs or eyelets.

5. Locate the black and brown stripes on the edge of the CCA. Using the paint pen provided, paint an orange stripe immediately following and the same length as the black and brown stripes.

6. Repeat steps 2 through 5 on the RF Switch Control PCB from the spare TOPCO.

Example 5.2.7-2

7. After installing the new 510k ohm resistors in both spare RF Switch Control PCBs (from the MICA and spare TOPCO), test them both by following steps 2 through 12 in the original installation instructions supplied in Field Change 22/19 to the AN/FPN-64(V)/64A(V).

8. Repeat steps 2 through 5 on the RF Switch Control PCB that was removed from the on-line TOPCO.

9. After installing the new 510k ohm resistors in the RF Switch Control PCB that was in the on-line TOPCO, test it by following steps 3 through 13 in the original installation instructions supplied in Field Change 22/19 to the AN/FPN-64(V)/64A(V).

10. After verifying that all the PCBs function properly, return one spare PCB into the spare TOPCO and the other one into the MICA for storage.

PARTS SUPPLIED WITH THIS ERRATA:

Item Name	**NSN**	**Quantity**
510k Ohm, ¼ Watt Resistors	5905-00-246-8690	6
Orange paint pen	None	1

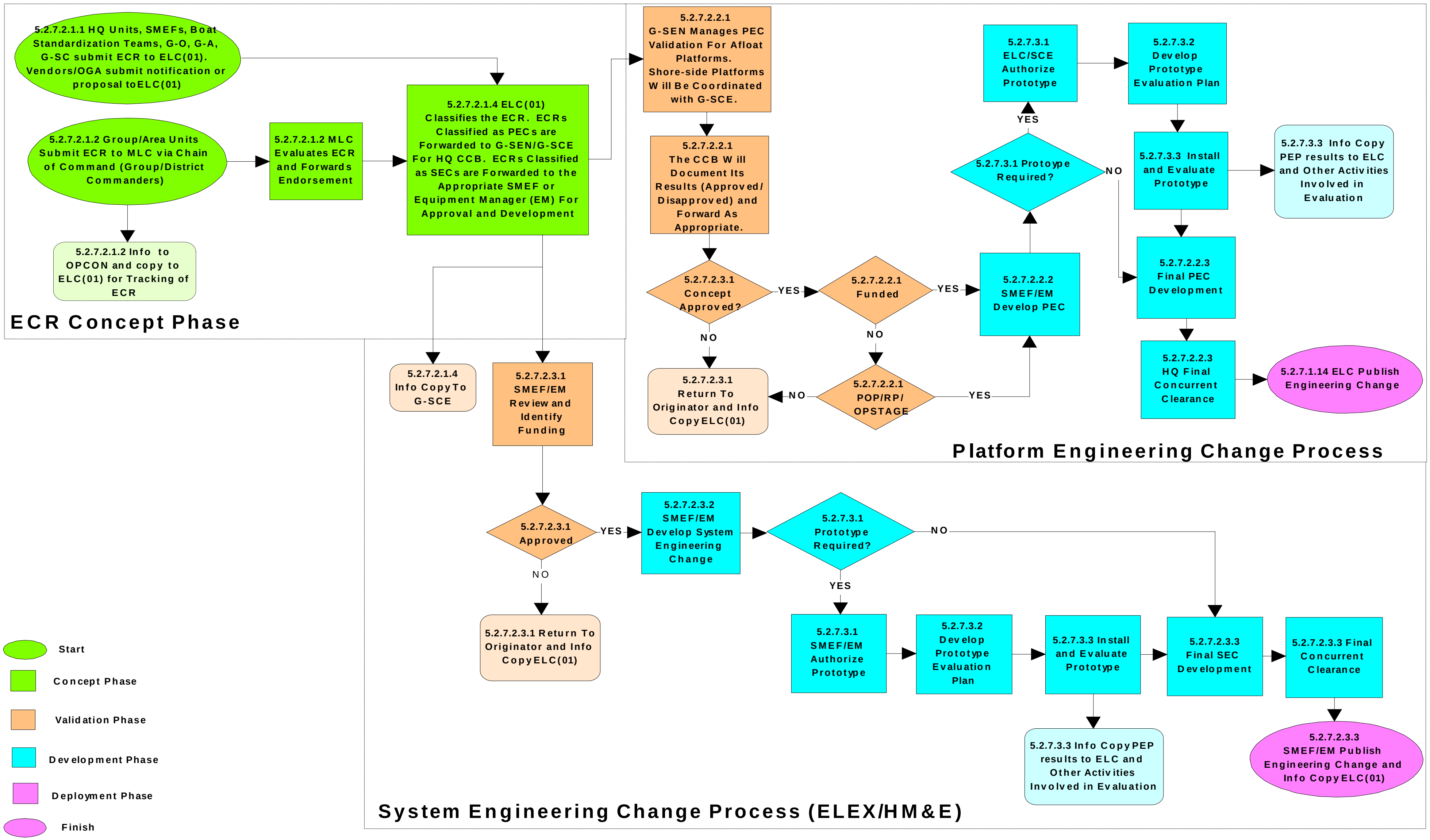
ROUTINE INSTRUCTIONS:

1. Record completion of this errata by making an entry on the Field Change Accomplishment Plate, National Stock Number (NSN) OI 0264-LP-456-6411 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Engineering Logistic Center, Baltimore, MD. Order directly using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-6674 applies.

3. Upon completion, a copy of this errata shall be inserted in front of all applicable technical manuals. Cognizant commands shall ensure that this errata has been accomplished and that applicable technical manual annotations and reports have been made.

G. K. Weeks, Jr.



Engineering Change Process

Figure 5.2.7-2

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5.2.8 Management Information for Configuration and Allowances (MICA)

5.2.8.1 Purpose

Management Information for Configuration and Allowances (MICA) establishes the unit material support for installed and portable equipment, and provides a listing of the equipment, parts, and supplies required for a unit to perform its operational mission. Each MICA document is tailored to a specific unit or unit class, and provides that unit with a predetermined level of support for its equipment.

5.2.8.2 Authority

The MICA is published under the authority in the Supply Policy and Procedures Manual, COMDTINST M4400.19 (series)

5.2.8.3 General

What is Management Information for Configuration and Allowances (MICA)?

?? The MICA is an allowance document prepared for, and "tailored" to, a specific, individual unit or unit class, that lists:

?? The equipment, components, and equipage verified as being on a unit to perform its operational mission;

?? The parts, special tools, and supplies required for the operation, maintenance, overhaul, and repair of equipment/components; and

?? The miscellaneous portable items, operating space items, and consumables necessary for the safety, care, and upkeep of the unit itself.

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5.2.8 Management Information for Configuration and Allowances (MICA), Continued

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5.2.8.3
General

Configuration data is a compilation of specific, detailed information on each and every component, and it's function, within a given system or platform (unit/unit class). It includes detailed information such as Nomenclature, manufacturer's name, part number, model number, the design and operating characteristics, and a description of the function performed for each equipment and component that makes up that system or platform.

1. The MICA document is a direct result of the initial establishment and subsequent maintenance of an accurate configuration database. Prompt reporting by the unit of changes resulting from additions, deletions, or modifications of equipment directly impact its accuracy.

5.2.8.4
Configuration Data Input

The quality of the MICA is only as good as the equipment configuration data available to Engineering Logistics Center (ELC). Since the MICA provides the unit with guidance for determining the items, and quantities, that should be stocked by supply or other departments, **it** is essential that changes be incorporated promptly and properly upon receipt. Corrective actions should be taken as soon as it is determined that any part of the MICA is inaccurate or incomplete. Accurate MICA, used correctly, helps guarantee successful logistics support for Coast Guard units.

5.2.8.5
What MICA provides

The MICA provides technical and supply information, which makes it an Integrated Logistics Support (ILS) document. It is a technical document to the extent that nomenclatures, operating characteristics, technical manuals, etc. are identified in Allowance Parts List (APL) and Allowance Equipage Lists (AELs). It is a supply document in the respect that it provides a complete list of all parts required to operate and maintain the unit and it's equipment, and to achieve maximum, self-supporting capability for extended periods of time.

5.2.8 Management Information for Configuration and Allowances (MICA), Continued

5.2.8.6 **MICA Content**	The content of the MICA encompasses Electronic and Hull, Mechanical, and Electrical (HM&E) equipment. It does not contain information relative to provisions (foodstuffs), recreational equipment, printing equipment, medical material, hydrographic charts, resale clothing, ship's store merchandise, bulk fuels and lubricants, or ammunition. Allowances for these items are published in unique lists prepared by the appropriate activities.
5.2.8.7 **Process in producing MICA**	The following paragraphs illustrate the processes involved in producing the MICA:
5.2.8.7.1 Provisioning Technical Documentation	PTD is a generic term used for the technical information (drawings, schematics, parts lists, illustrated parts breakdowns, operators and technical manuals, etc.) provided by, or obtained from, contractors, manufacturers, and/or vendors of the equipment onboard a particular unit. The Contractor shall provide an Engineering Data for Provisioning (EDFP) for the equipment being provided to the government under a contract. The depth of information available to the Coast Guard varies by degrees depending on the contract, the equipment, the manufacturer, the vendor, etc. In some instances, this information is proprietary and therefore is not available to the government.
5.2.8.7.2 Provisioning	The Coast Guard is constantly procuring new platforms, systems, equipment, and components. These must be supported with items such as spare and repair parts, special tools, test and support equipment. The process of provisioning determines parts, supplies, tools, etc., required to support the equipment for an initial period of service, and to develop an APL if necessary. Demand and usage throughout the initial support period will be a driving factor for the levels of additional or follow-on support throughout the equipment's life cycle.

5.2.8.7.3
Boat Class Maintenance Plan (BCMP) and the Cutter Class Maintenance Plan (CCMP)

Boat Class Maintenance Plan (BCMP) and the Cutter Class Maintenance Plan (CCMP): The BCMP and the CCMP all provide varying degrees of guidance concerning the requirements of maintenance and the ability of a specific unit class to perform that maintenance. This guidance is provided by the Program Manager, and takes into consideration such things as the unit's mission, unit design, the number of required operational days, the number of maintenance days available, watch standing requirements, crew size, and billet structure. The BCMP are "living" documents, and are constantly being updated throughout the construction and testing periods to reflect changes or new developments. Eventually the Maintenance Support Guide (MSG) is incorporated into the CCMP or the BCMP. Presently, very few units or unit classes have this level of guidance in place.

5.2.8.7.4
Lead Allowance Parts List (LAPL)

For Hull, Mechanical, and Electrical (HM&E) equipment, the Lead Allowance Parts List (LAPL) reflects the requirements of a generic unit equipment maintenance plan and is a guide used in the preparation of APLs. The LAPL for each equipment category lists those types of items determined by the Coast Guard to be maintenance significant, e.g., the LAPL for a centrifugal pump might show that all shims, seats, sleeves, seals, etc., are considered to be maintenance significant. The LAPL, in conjunction with available PTD, guidance provided by the MSO/MSG and/or BCMP/CCMP and other criteria, is used to develop the APL.

5.2.8.8
MICA Master File (MMF)

The MICA Master File (MMF) is the Coast Guard's central Electronic (ELEX) and Hull, Mechanical, and Electrical (HM&E) equipment. It contains the technical characteristics and logistic data on equipment in the Coast Guard's HM&E and ELEX inventory as well as the maintenance worthy parts and equipage associated with that equipment. The MMF maintains technically oriented configuration and logistics data as well as supply support information.

5.2.8 Management Information for Configuration and Allowances (MICA), Continued

5.2.8.8.1 MMF Technical Characteristics

The technical characteristics provided on the APL and AEL describe the form, fit, and function of the equipment. Technical characteristics may include drawing number(s), operating characteristics such as speed and pressure, the manufacturer's name and part number, technical manual and plan number, and other information needed to identify, maintain, or procure the item.

5.2.8.8.2 MMF Information to maintain equipment

The MMF also contains similar information on all parts needed to maintain the equipment. Typical data found in the MMF includes the maintenance philosophy for each equipment and component, guidance for anticipated failure and replacement, unit locations, related APL or AEL numbers, quantity per application, and other logistics information. The file also includes supply support information such as stock numbers, unit prices, unit of issue, source of supply, and part number to stock number cross-reference information.

5.2.8.8.2.1 Allowance Parts Lists

Allowance Parts List (APL) is developed using information obtained from manufacturers and vendors of the applicable equipment or components. Part II, Sections A and B of the MICA contains all of the ELEX and HM&E APLs associated with a unit. APLs specify all maintenance significant parts associated with the equipment, in accordance with the units' MSG or BCMP/CCMP.

5.2.8.8.2.2 Allowance Equipage Lists

Allowance Equipage Lists (AELs) are prepared under the direction of the Program Manager and/or Sponsor, as well as with information obtained from manufacturers and vendors. Part II, Section C of the MICA contains all of the AELs associated with the unit. AEL describe a component or system, such as damage control, and supports that component or system with a range of Operating Space Items (OSIs), and lists the required allowances. This material falls into the general category of tools and equipage, which are retained in the custody of the user department. In some cases, parts that are intended to be kept in the same compartment with the installed equipment are found in AELs instead of in APLs.

5.2.8 Management Information for Configuration and Allowances (MICA), Continued

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5.2.8.9
MICA Formats

The MICA consists of a User Guide and five parts. Hard copy MICA documents are produced for Electronic (ELEX) and Hull, Mechanical, and Electrical (HM&E) equipment. Major cutters will receive one master MICA consisting of ELEX and HM&E for their supply department. In addition they will receive an ELEX only MICA for their ET's and a HM&E MICA for their MK's, EM's, etc. Electronic Support Units (ESU)/Electronics Support Detachments (ESD)/ Electronic Support Detachment Details (ESDD), Loran and Communications Stations will receive an ELEX only MICA representative of the units under their area of support. On the other hand, Groups and Small Boat Stations will receive a HM&E only MICA representative of the units under their area of support. Your type of unit determines which sections in the MICA you will receive. For example, PART III of the MICA, the Stock Number Sequence Lists, contains five sections. Your unit will only receive the sections that apply to you. Newly constructed cutters will not receive the supply aids (PART V) with their initial MICA. The supply aids will be incorporated in follow on MICA's for those units. An explanation of the sections of the MICA are listed below:

5.2.8.10
MICA User Guide

The MICA User Guide (MUG) describes the MICA data elements, notes, and codes. It contains samples of each page type and is a valuable reference for finding information throughout the MICA.

5.2.8.10.1
User Guide Part I

Part I. MICA Part I contains the four index sections and is sorted by discipline:

?? Section A: Equipment Nomenclature Sequence — Is a listing of all APLs/AELs in unit's configuration sorted by Equipment nomenclature.
?? Section B: HSC DESCRIPTION Sequence — Is a listing of all APLs/AELs in unit's configuration sorted by Hierarchical Structure Code (HSC) or Extended Ships Work Breakdown Structure (ES WBS) Description.
?? Section C: HSC CODE Sequence — Is a listing of all APLs/AELs in unit's configuration sorted by Hierarchical Structure Code (HSC) or Extended Ships Work Breakdown Structure (ES WBS) Code.
?? Section D: APL/AEL Sequence — Is a listing of all APLs/AELs in unit's configuration sorted by APL/AEL sequence.

5.2.8.10.2 User Guide Part II

Part II. MICA Part II is divided into the three sections:

- ?? Section A: APLs — Electronics (ELEX) — Is a copy of all Electronic APLs listed under unit's configuration. These APLs list the parts breakdown of each electronic APL. Some may exist with no central support, but are listed for configuration purposes only.
- ?? Section B: APLs - Hull, Mechanical, and Electrical (HM&E) — Is a copy of all Hull, Mechanical and Electrical APLs listed under unit's configuration. Most APLs list the parts breakdown of each Hull, Mechanical and Electrical (HM&E) APL. Some are listed as locally supported, while others may exist with no support, but are listed for configuration purposes only.
- ?? Section C: AELs - Hull, Mechanical, and Electrical — Is a copy of all AELs stating the Equipage/Outfit of a unit's configuration. This listing provides a breakdown of all Equipage/Outfit required by the unit to perform a mission. This list does not include General Use Consumable items.

5.2.8.10.3 User Guide Part III

Part III. MICA Part III contains up to five sections:

- ?? Section A: Stock Number Sequence List (SNSL) Electronics Items (ELEX) -This list provides a listing of all National Stock Numbers of spare parts required in unit's storeroom for support of the Electronics APLs.
- ?? Section B: Stock Number Sequence List (SNSL) GROUP - This list provides a listing of all National Stock Numbers in NIIN sequence of spare parts required at the GROUP in support of the HM&E APLs.
- ?? Section C: Stock Number Sequence List (SNSL) Storeroom Items (SRI) -This list provides a listing of all National Stock Numbers in NIIN Sequence of spare parts required in the unit's storeroom for support of HM&E APLS.
- ?? Section D: Stock Number Sequence List (SNSL) Operating Space Items (OSI) - This list provides a listing of all National Stock Numbers in NIIN sequence on all Equipage/Outfit required by the unit to perform a mission
- ?? Section E: Stock Number Sequence List (SNSL) STATION - This list provides a listing of all National Stock Numbers in NIIN sequence of spare parts required at the STATION in support of the HM&E APLs.

5.2.8.10.4 User Guide Part IV

Part IV. MICA Part IV contains up to six sections:

?? Section A: Part Number Cross Reference (ELEX) - This section lists all the Part Numbers associated with the units ELEX repair parts. It is sorted by Part Number sequence to corresponding NIIN/ACN, APL/AEL number and Item Name.
?? Section B: Part Number Cross Reference (HM&E) - This section lists all the Part Numbers associated with the units HM&E repair parts. It is sorted by Part Number sequence to corresponding NI1N/ACN, APL/AEL number and Item Name.
?? Section C: NSN/ACN Cross Reference (ELEX) - This section lists all the NSNs and ACNs associated with the units ELEX repair parts. It is sorted by NIIN sequence to corresponding part number, APL/AEL number and Item Name.
?? Section D: NSN/ACN Cross Reference (HM&E) - This section lists all the NSNs and ACNs associated with the units HM&E repair parts. It is sorted by NIIN sequence to corresponding part number, APL/AEL number and Item Name.
?? Section E: MMF APL to WSF APL Cross Reference - This is a cross-reference listing of MICA Master File APL numbers to Navy Weapon Systems File numbers by discipline; ELEX and HM&E.
?? Section F: WSF APL to MMF APL Cross Reference - This is a cross-reference listing of Navy Weapon Systems File APL numbers to MICA Master File APL numbers by discipline; ELEX and HM&E.

5.2.8.10.5
User Guide Part V

Part V. MICA Part V contains up to twenty two (22) sections:

?? Section A: NSN change list - Listing of all applicable ELEX NSN changes since the units last allowance document.
?? Section B: NSN change list - Listing of all applicable GROUP HM&E NSN changes since the units last allowance document.
?? Section C: NSN change list - Listing of all applicable HM&E NSN changes since the units last allowance document.
?? Section D: NSN change lists - Listing of all applicable Operating Space Items (OSI) NSN changes since the units last allowance document.
?? Section E: NSN change list - Listing of all applicable Station level HM&E NSN changes since the units last allowance document.
?? Section F: Addition List - Listing of new ELEX OBRPs as a result of revised MICA.
?? Section G: Addition List - Listing of new GROUP HM&E OBRPs as a result of revised MICA.
?? Section H: Addition List - Listing of new HM&E OBRPs as a result of revised MICA.
?? Section I: Addition List - Listing of new Operating Space Items (OSI) as a result of revised MICA.
?? Section J: Addition List - Listing of new STATION HM&E OBRPs as a result of revised MICA.
?? Section K: Monetary List - Listing of the dollar value of deficient ELEX items.
?? Section L: Monetary List - Listing of the dollar value of deficient GROUP HM&E items.
?? Section N: Monetary List - Listing of the dollar value of deficient Operating Space Items (OS I).
?? Section O: Monetary List - Listing of the dollar value of deficient STATION HM&E items.

Continued on next page

5.2.8.10.5 User Guide Part V, Continued

- ?? Section P: Deletion List - Listing of ELEX OBRPs no longer required to remain in inventory.
- ?? Section Q: Deletion List - Listing of GROUP HM&E OBRPs no longer required remaining in inventory.
- ?? Section R: Deletion List - Listing of HM&E OBRPs no longer required remaining in inventory.
- ?? Section S: Deletion List - Listing of Operating Space Items (OSI) no longer required to remain in inventory
- ?? Section T: Deletion List - Listing of STATION OBRPs no longer required to remain in inventory
- ?? Section U: Mandatory Turn-in - Listing of ELEX Repairable items that must be returned to cognizant repair facility or OGA.
- ?? Section V: MAMS Listing - Listing of ELEX Maintenance Assist Modules In addition to the above, the following Supply Aids may be provided:

5.2.8.10.5.1 DD-1348-1A

DD-1348-lA for each item on the Deletion List. These are to be used when an item is to be returned to the Source of Supply utilizing excess procedures in the Comptroller Manual. Not available at this time.

5.2.8.10.5.3 COSAL Requisition File

COSAL Requisition File: (ELEX ONLY) Requisitions for deficient Navy Type/Navy-Owned OBRPs will be processed through the ELC to FISC Puget Sound. Units will receive a letter that lists the Document Numbers of the requisitions. Units are responsible for tracking status.

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5.2.9 Test Equipment Management

5.2.9.0.1 Overview

This section contains policy and information concerning the administration of shipboard, shore, and avionics electronic test equipment in use throughout the Coast Guard. In this section you can find general information, recommended electronic test equipment requirements for units with electronic technicians assigned, guidance on test equipment allowance lists, guidance on test equipment calibration requirements and special instructions for Navy Type electronic test equipment. The Coast Guard uses electronic test equipment to adjust, maintain or repair electronic equipment installed throughout the service. Test equipment is divided into three categories: General Purpose Electronic Test Equipment (GPETE), Special Purpose Electronic Test Equipment (SPETE) and Calibration Test Equipment. Printed circuit card extenders and test cable extenders are not test equipment. These items fall in the category of special tools or accessory parts, which are normally provided by the unit. Test equipment is owned by the MLC's its configuration shall be controlled and maintenance conducted to maintain its mission capability.

5.2.9.0.2 Standardizing Test Equipment

Support and calibration problems are minimized if the test equipment procured is of the same make and model as that which is procured by Coast Guard MLCs and other government agencies (OGA). Most test equipment procured by OGA is included in their support and calibration programs that are, in most cases, available to the Coast Guard. Therefore, major considerations shall be given to procuring through those agencies or the commercial types carried in their system. Test Equipment Index NAVSEA ST000-AA-IDX-010-TEI, (CD-ROM) is provided as standard distribution to MLCs and Headquarters units. It is an excellent guide for identifying standard test equipment, equipment specifications, commercial equivalents, national stock numbers (NSNs), and acceptable substitutes for equipment currently in use throughout the Coast Guard. A primary concern with all test equipment procurements, particularly commercial off-the-shelf, should be the support and calibration costs and downtime.

5.2.9.0.3 Navy Special Purpose Electronic Test Equipment

Special Purpose Electronic Test Equipment (SPETE) used to support Navy owned equipment will be supplied with the electronic equipment during installation. Support of Navy SPETE will be funded by Commandant (G-SCE) as part of the NTNO support plan and managed by the MLC. Commandant (G-SCE).

5.2.9.0.4 Contents

This section contains the following topics:

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5.2.9.1 Definitions and Acronyms

5.2.9.1.1 Electronic Test Equipment	Electronic test equipment is that equipment used to measure, compare, analyze or adjust the electrical and electronic parameters, signals and waveforms of electronic equipment.
5.2.9.1.2 General Purpose Electronic Test Equipment (GPETE)	GPETE is test equipment that measures or generates a range of parameters of electronic functions common to two or more equipments or generates a range of parameters or electronic functions common to two or more equipments or systems of basically different design.
5.2.9.1.3 Special Purpose Electronic Test Equipment (SPETE)	SPETE is test equipment of special design or specially modified GPETE for use with a specific equipment or system, excluding medical test equipment.
5.2.9.1.4 Calibration Test Equipment	Calibration test equipment is equipment solely used to calibrate GPETE or SPETE.
5.2.9.1.5 Accessory Parts	Accessory parts are items that are used in conjunction with GPETE or SPETE to facilitate ease of measurements. Examples of accessory parts are printed circuit board extenders, special cable connectors and cable extenders.
5.2.9.1.6 Traceable Standards	Traceable standards means that the standard used for calibration is traceable back to the established and accepted National Institute of Science and Technology (NIST) standard.

5.2.9.1 Definitions and Acronyms, Continued

5.2.9.1.7 Original Equipment Manufacturer (OEM)

The OEM is the original manufacturer of an item. Support and test equipment requirements are usually contained in the OEM's equipment technical manual.

5.2.9.1.8 Navy Type, Navy Owned (NTNO)

Standard Navy type equipment that is procured by the Navy, or with Navy funds, and used by the Coast Guard in support of Navy mission requirements.

5.2.9.1.9 SCAT Code (Sub Category)

SCAT codes are utilized in the Test Equipment Index (NAVSEA ST000-AA-IDX-010-TEI) to group different models of GPETE that perform the same function.

5.2.9.1.10 Priority Code

A three-character code used to identify the priority (order of preference) for different test equipment model within a SCAT Code. Definitions of model priorities are:

5.2.9.1.11 Standard

006-021 - Denotes the most advanced and satisfactory equipment approved for service use.

NOTE:
A priority of 013 or 014 indicates that the applicable model is a STANDARD item.

5.2.9.1.12 Substitute Standard

022-037 - Denotes equipment approved for service use, which do not have as satisfactory military characteristics as "STANDARD" equipment. NOTE: Supply regulations do not allow repair of items with priority greater than 038. However, this may be superceded by mission requirements.

5.2.9.1 Definitions and Acronyms, Continued

5.2.9.1.13 Limited Standard

038-071 - Denotes those equipment approved for service use, which do not have as satisfactory military characteristics as "Standard" or "Substitute Standard" equipment but are usable substitutes.

5.2.9.1.14 Obsolescent

072-094 - Denotes equipment, which no longer has satisfactory military characteristics, but which, must be continued in service, pending availability of improved replacements.

5.2.9.1.15 Obsolete

095-099 - Denotes equipment, which have been declared unsuitable for their original military purpose. Units having equipment with priority code 072-099 should request replacement through their cognizant MLC. Disposal of obsolete equipment will be expedited.

5.2.9.1.16 Avionics Test Equipment

Avionics test equipment is that special purpose test equipment which is designed for and used to support only aircraft avionics.

5.2.9.2 Responsibility

5.2.9.2.1 Headquarters, Areas and District Units Responsibility

All units are required to comply with the cognizant MLC (t) electronic test equipment program and to report all electronic test equipment as Electronics Installation Records in AIM in accordance with Chapter 6 of this Manual and other effective instructions. This ensures an accurate inventory, which is used for determining initial issue and replacement requirements, repair and calibration requirements, and disposal requirements of electronic test equipment.

5.2.9.2.2 MLC Responsibility

The MLCs are delegated authority to establish and administer an electronic test equipment program in accordance with the guidance in this Manual. The MLC test equipment program shall include replacement, acquisition, issue, repair, calibration, and disposal of all electronic test equipment with the following exceptions:

5.2.9.3 Exceptions

5.2.9.3.1 Except avionics	Avionics test equipment policy is outlined in Aeronautical Engineering Maintenance Management Manual, COMDTINST M13020.1 (series). In general, avionics test equipment is procured and controlled by Commandant (G-SEA) while inventory; maintenance and calibration are the responsibility of the MLCs. Paragraph A.3.g of this chapter defines avionics test equipment.
5.2.9.3.2 Except R&D Center	Commandant (G-CIR) and the Coast Guard Research and Development Center exercise complete control over the acquisition, maintenance, calibration and disposal of the electronic test equipment used in the research and development program.
5.2.9.3.3 Except new equipment or systems	The Acquisition Manager for an equipment or system shall automatically provide Special Purpose Electronic Test Equipment (SPETE) to all units having or supporting that equipment or system and inform both MLCs. The inventory management, maintenance and calibration of this equipment is the responsibility of the MLCs.
5.2.9.3.4 Except newly commissioned units	The Acquisition Manager for a newly commissioned platform shall automatically provide Special Purpose Electronic Test Equipment (SPETE) and General Purpose Test Equipment (GPETE) to the newly commissioned unit and inform the appropriate MLC.
5.2.9.3.5 Except new projects	The Project Managers shall automatically provide Special Purpose Electronic Test Equipment (SPETE) and General Purpose Test Equipment (GPETE) required due to changes, replacements, removals, or upgrades of equipment/systems or CGPMS Procedures for those equipment/systems.
5.2.9.3.6 Except Navy Owned Weapons Equipment	Test equipment required to maintain Navy-owned Weapons Systems shall be supported utilizing NAVORD funding received from the Navy as per the Ordnance Manual, COMDTINST M8000.2 (series) para 4.b.3.a.

5.2.9.4 Maintenance and Repair

5.2.9.4.1 Maintenance Philosophy

The maintenance philosophy and the maintenance requirements of the equipment to be supported determine requirements for electronic test equipment. This philosophy is specified in the Equipment/System Integrated Logistics Support Plan (EILSP) for the electronics equipment at the time the equipment is procured and generally identifies the test equipment by SCAT Code or the commercial equivalent specified in the technical manual.

5.2.9.4.2 Application of Electronic Equipment

The application of electronic test equipment is determined by the configuration of the individual test instrument. Some instruments are designed to perform only one function, such as a single range voltmeter or an electrical dummy load. Other instruments, such as a test set, are multifunction and can provide various stimuli (i.e., generate signals of various frequencies, currents, voltages, etc.) and measurement (i.e., volt, ohm, ampere, etc.) functions.

5.2.9.4.3 Organizational Level Maintenance

Due to critical calibration and accuracy requirements, internal maintenance shall not be done at the unit or organizational level unless specified in the technical manual and the unit has qualified technicians assigned. Special attention should be given to the handling and storage of all test equipment to prolong serviceability, calibration reliability and accuracy.

In general, organizational level maintenance shall be limited to routine cleaning and minor maintenance that does not require the re-calibration of the test equipment. Examples of routine maintenance include:

?? Maintain the outer case clean of grease, oil, dust, dirt, rust and other foreign matter.
?? Maintain the equipment chassis free of dust, dirt and other foreign matter.
?? Replace broken or missing knobs, screws, handles, faceplates, etc.
?? Replace fuses and lamps as necessary.
?? Inspect gaskets and replace as necessary.
?? Inspect and ensure that all accessories are available and in working order.
?? Resolve all outages or suspected "out-of- calibration" conditions to the proper authority in accordance with current MLC instructions.

5.2.9.4.4 Intermediate Level Maintenance

No intermediate level maintenance or repair is planned. The MLCs, however, may designate properly staffed and equipped electronics shops as Intermediate Level Maintenance facilities.

5.2.9.4.5 Depot Level Maintenance

Corrective repair and calibration will be performed at the depot level. Depots for test equipment may be commercial vendors, manufacturer representatives, DoD Calibration Facilities (CALFAC) or Other Government Agency (OGA) facilities as designated by the MLC.

5.2.9.4.6 Corrective Repair

Corrective repair of electronic test equipment usually requires the calibration of the instrument to traceable standards available only at calibration facilities. Therefore, corrective repairs should not be attempted at the unit level. Corrective repair is discussed later in this section.

5.2.9.4.7 Repair and Calibration

The responsibility for repair and calibration of Coast Guard electronic test equipment is assigned to each MLC and is covered in detail in Section D. The MLCs must specify or acquire the repair and calibration facilities most suited for its needs. Listed below are the more predominant methods in use throughout the Coast Guard:

5.2.9.4.8 Factory Repair and Calibration

Warranty and non- warranty repairs and calibration of commercial electronic test equipment which is accomplished by the factory or a OEM authorized repair facility.

5.2.9.4.9 Commercial Repair and Calibration

Electronic test equipment that is repaired and calibrated by a commercial facility utilizing standards whose calibration is certified as being traceable to the National Standard.

5.2.9.4.10 Other Military Services

The Coast Guard utilizes the repair facilities of other military services extensively by negotiating an inter-service support agreement with the service concerned. Naval Calibration Facilities and Air Force Precision Measurement Equipment Laboratories (PMEL) are the prime sources used.

5.2.9.4.11 Service Discounts

Several test equipment manufacturers in the General Services Administration (GSA) Schedules offer Service discounts for non- warranty repair or calibrations. GSA schedules must be consulted for details in order to take advantage of these discounts.

5.2.9.4.12 Non Warranty Repair and Calibration

Program Managers shall inform MLC's and units of the correct warranty procedures for test equipment purchased under GSA contracts with certain commercial companies provide for a non-warranty repair and calibration fund that is based on a percentage of the GSA catalog list price for that product. In essence, every time a government agency purchases a piece of electronics equipment from participating companies using the GSA schedules, a percentage of the GSA catalog list price for that product is credited to a non-warranty repair and calibration fund maintained by the individual company. That fund may be used by any government agency for the repair and calibration of that company's instruments. By using this fund it may be possible to achieve cost reductions when repairing or calibrating electronic test equipment that qualify. It does not matter whether the piece of equipment has been purchased on a GSA contract; all equipment of the particular manufacturer qualifies. MLC commanders and commanding officers of Headquarters units should contact the nearest company representatives to determine local availability, policy, and procedures for use of the repair and calibration fund. Any policies and procedures adopted for use of the fund should be incorporated into applicable test equipment maintenance doctrine.

5.2.9.5 Basic Allowance for Electronic Test Equipment

5.2.9.5.1 Overview

The electronics equipment on the unit Electronic Installation Record (EIR) and the maintenance philosophy of the equipment determines the basic allowance for electronic test equipment at shore and floating units. The equipment's Equipment/System Integrated Logistics Support Plan (EILSP) contains the test equipment, publications and specific levels of maintenance for that unique piece of equipment. Headquarters units shall develop their test equipment allowance based on the maintenance philosophy of the equipment being supported. The CGPMS Manager can provide a unit unique test equipment list based on installed equipment to assist in decision making/outfitting. The allowance of electronic test equipment must be kept at a level that is adequate to support the installed electronic equipment while at the same time ensuring the test instruments can be adequately maintained. This can best be accomplished by keeping the number of different "types" of test equipment in the unit inventory to an absolute minimum.

5.2.9.5.2 Approved Types

Refer to Test Equipment Index NAVSEA ST000-AA-IDX-010-TEI, (CD ROM) for the approved types of general-purpose test equipment standards, substitute standards, specifications, stock numbers, and related guidance.

5.2.9.5.3 Allowance Changes

MLCs shall make changes to units' test equipment allowances as new requirements are established by the appropriate Headquarter units' program/Project Managers. Headquarters units are responsible for determining their own test equipment requirements and establishing a test equipment program commensurate with these needs. In all instances, the CGPMS Manager shall be notified of the change to the unit's test equipment allowance. Operating units shall submit requests for allowance changes with justification to MLC (t) via the operational chain of command.

5.2.9.5.4 Requesting Allowance Changes

Requests for allowance changes shall specify the intended use of the requested test equipment; what equipment it is to support; what tests are to be performed; what ranges and tolerances are required; and any other information which will assist in evaluating the change and obtaining suitable test equipment.

The CGPMS Manager shall insure, wherever possible, the CGPMS maintenance procedures are written so the procedures can be performed on a generic type of GPETE regardless of the manufacturer or model number of the test equipment.

5.2.9.6 Acquisition and Disposition

5.2.9.6.1 Delegation of Authority	MLCs are the authorized agents for the acquisition of replacement electronic test equipment and may delegate this authority to District and Area Units for specific categories of electronic test equipment, e.g. hand held voltage, resistance and/or current meters.
5.2.9.6.2 District and Area	District and Area units shall not acquire electronic test equipment without MLC approval.
5.2.9.6.3 CGPMS Notification	The Program Manager is responsible for notifying the CGPMS Manager of new acquisitions. The MLC is responsible for notifying the CGPMS Manager of new replacement acquisitions.
5.2.9.6.4 Headquarters Units	Headquarters units may acquire electronic test equipment, as authorized by their program sponsor, but shall inform the MLC and the CGPMS Manager of the acquisition. The Headquarters unit shall also report the test equipment in AIM or CMPlus, in accordance with Chapter 5.2.4 of this Manual, to ensure appropriate support.
5.2.9.6.5 Inventory and Accountability	All electronic test equipment shall be reported by the user in the Accountable Item Management (AIM) system as an EIR item as required in Chapter 5.2.4 of this manual and other current property management instructions. Unit AIM or CMPlus software shall be used in accordance with Chapter 5.2.4 of this Manual and the Property Management Manual, COMDTINST M4500.5 (series). Per the Central Chief Financial Officer (CFO) Act of 1990, electronic test equipment is recorded, via the EIR, in Oracle Assets under its own Minor Category. Test equipment cost which meets the capitalization threshold ($25K) shall be capitalized and recorded separately in its own Minor Category.

5.2.9.6 Acquisition and Disposition, Continued

5.2.9.6.7 Funding

Depending upon the purpose of the test equipment and the scope of use of the test equipment, and the cognizant MLC policy either AFC 30 or AFC 42, funds may be used to procure and calibrate test equipment.

5.2.9.6.8 Disposition instructions

Instructions for the disposition of electronic test equipment are the Property Management Manual, COMDTINST M4500.5 (series).

5.2.9.6.9 MLC Authority for Disposition

MLCs are the authorized agents for the disposal of electronic test equipment. District and Area Units shall not dispose of electronic test equipment without the approval of the cognizant MLC. Headquarters units may excess electronic test equipment as authorized by their program sponsor but shall inform the MLCs to maximize reuse of excess test equipment. Headquarters units shall not dispose of general-purpose test equipment without MLC approval. Procedures for survey boards and disposing excess property and instructions on the preparation of survey reports and excess property reports are provided in the Property Management Manual, COMDTINST M4500.5 (series).

5.2.9.7 Calibration Policy

5.2.9.7.1 Overview

The MLCs shall develop a calibration interval standard based on manufacturer's recommended practice, DoD practice, or industry standard. When determining the calibration interval, MLCs shall consider the operating environment, current industry and DoD practices, and the equipment condition. The MLC's shall collaborate to develop and maintain a Coast Guard calibration interval standard guide. Standards and test equipment used for quantitative measurement should be calibrated to a level of accuracy commensurate with their use. Such services should be performed at intervals established on the basis of stability, purpose, and degree of usage. Intervals should be shortened as required to assure continued accuracy as evident by the results of the preceding calibrations. The interval may be lengthened when the results of previous calibrations and usage indicate that such action will not adversely affect the accuracy of the system or resources are inadequate to calibrate at the recommended intervals. Each MLC shall develop a suitable program and publish the necessary instructions by which the electronic test equipment can be repaired and calibrated. Electronics personnel are responsible for reviewing and becoming familiar with the procedures set forth by the MLC.

5.2.9.7.2 Calibration Standards

Calibrations shall be performed using approved Navy Instrument Calibration Procedures (NICP's) or Navy Local Calibration Procedures (NLCP's), whenever possible. When NICP's are not available, calibration shall be performed using calibration instructions and data obtained from the technical manual and/or commercial sources. Specific intervals and calibration procedures are determined by the MLC commander or Headquarters unit based on usage, previous performance, funding, methods, calibration equipment, calibration tolerances; manufacturer recommendations and labor resource limitations.

5.2.9.7.3 NICP Publication Requests

NICP publications are available via the NWAS Corona web page at http://metrology.corona.navy.mil/. User registration and password request is required. Also available from this web page are Calibration Procedures and Calibration Intervals.

5.2.9.7.4 Calibration Intervals

The basic calibration intervals for most general-purpose electronic test equipment are listed in the NICP's/NLCP's. These intervals closely follow the average of the calibration intervals used by the other military services. In many instances, the Coast Guard will not be able to calibrate as specified in NICP's/NLCP's due to availability of replacement equipment, operational schedules and labor resource limitations. The actual calibration interval and any adjustment thereto shall be determined by the MLC and published in an MLC instruction. The intervals provided by the MLC are the maximum intervals between calibrations under normal conditions. If confusion exists between a CALFAC's periodicity specification and the MLC's, the MLC shall be the not-to-exceed limit.

5.2.9.7.5 Calibration Labels and Tags

Each item of test equipment shall have a tag or label attached to it denoting the calibration status of the instrument, including the calibrating facility and the date last calibrated. The tag or label will differ from area to area depending on whether the instrument was calibrated by the factory, commercial facility, or other military facility.

5.2.9.7.6 Use of Out-of-Calibration Equipment

Test equipment that is considered out-of-calibration shall be tagged as Out-of-Commission (OOC) and shall not be used.

5.2.9.7.7 MLC as Monitor

Each MLC, in accordance with its policies, shall monitor the calibration program to ensure GPETE and SPETE are being calibrated in accordance with the schedule and promulgated instructions. MLCs shall randomly select and inspect units to ensure compliance with the calibration program guidelines. If a unit is found to be derelict in complying with the calibration program, the Operational Commander shall be notified.

5.2.9.7.8 EMO as Monitor

The Unit's EMO shall monitor the calibration program at the unit to ensure compliance with the Guidance provided by MLC and communicate discrepancies, which could not be resolved, to their MLC.

5.2.9.7.9 COTR as Monitor

Contract maintenance facilities or personnel shall comply with the terms of the governing contract. The Contracting Officer's Technical Representative (COTR) shall ensure that calibration requirements and provisions are contained in the contract Statement of Work (sow) as appropriate.

5.2.9.8 Quality Assurance Program

5.2.9.8.1 Overview	The MLC shall establish a quality assurance program for electronic test equipment to ensure the calibration and repair services are meeting the needs of the service at a reasonable cost and in a timely manner. Factors to be considered are: ?? Calibration interval is appropriate to ensure adequate test equipment availability for current environment and planned use. ?? Calibration and Repair Facility performance meets requirements for traceable standards, timely service, appropriate labeling, etc. ?? Calibration Schedule is being met or that deviation from the schedule is within MLC established standards.
5.2.9.8.2 Headquarters Responsibility	Headquarters units shall, if not participating in the MLC QA program, establish a local quality assurance program using the MLC program as a guide.
5.2.9.8.3 MLC Responsibility	The ESUs/ESDs shall use the MLC QA program and provide feedback to the MLC for improvements as appropriate.
5.2.9.8.4 Area/District Units Responsibility	Area and district units shall comply with the MLC test equipment QA program and report discrepancies as required or appropriate.

5.2.9.9 Receiving Test Equipment

5.2.9.9.1 Overview

Test equipment received from a CALFAC shall be inspected for visual discrepancies and checked for proper operation. Comparison of measurements with similar test equipment can easily detect major problems. Discrepancies noted should be reported to the MLC via the cognizant ESU/ESD.

5.2.9.9.2 Excess Test Equipment

Test equipment, which is excess and pending disposal, shall be clearly marked and shall not be calibrated.

5.2.9.9.3 Packing Accessories

All accessories (probes, cables, extender cards, etc) for a specific piece of test equipment shall be sent with the test equipment to the calibration facility.

5.2.9.10 Navy-Type Navy-Owned (NTNO) electronic equipment

5.2.9.10.1 Support

The Navy provides Special Purpose Test Equipment to aid the maintenance and support of Navy Type, Navy Owned (NTNO) equipment used by the Coast Guard for Navy mission requirements.

5.2.9.10.2 Basic Allowance

Commandant (G-SCE-2) provides authorization for NTNO test equipment. NTNO test equipment is distributed directly by the Navy or through the MLC. The type of NTNO equipment installed and the Coast Guard maintenance and support philosophy for that equipment determines unit requirements. NTNO test equipment MUST be entered in the unit Electronic Inventory Record (EIR) and the Navy Weapons System File (WSF) to obtain Navy support funding and calibration services from Commandant (G-SCE-2) or MLC. Requests for new installations or replacement of NTNO test equipment should be directed to Commandant (G-SCE- 2). A Ship's Configuration Change Form (CCF) OPNAV 4790CK is used to report NTNO equipment to the configuration data manager at the ELC.

5.2.9.10.3 Calibration and Maintenance

Calibration and maintenance support for NTNO test equipment is managed by the MLC using shall use Navy funds provided by Commandant (G- SCE-2). The process for requesting Navy support funds is described in Support of Navy-Type, Navy-Owned Electronics Equipment, COMDTINST M7100.2 (series).

5.3 Systems Overview

5.3.0.1 Overview

The Coast Guard has several core systems that permit our assets to perform their missions. Although this Manual is not intended to replace the appropriate technical manuals, it is expected to provide the reader with a general overview of the types of systems employed by the Coast Guard and how they work to accomplish the Coast Guard mission.

5.3.0.2 Objectives

To provide a summary of the various complex systems used within the Coast Guard.

5.3.0.3 Contents

This section contains information on the following topics:

5.3.1 Communications Systems

5.3.1.0.1 Overview

This section provides general information and policy for shipboard and shore communications equipment. Specific information on any communication system may be found in the equipment technical manuals and other official Coast Guard documentation. Radio frequency communications, as covered in this section, encompass all means of transmitting and receiving electromagnetic (radio) waves for shipboard and shore communications. Radio frequency transmissions and receptions for other purposes such as direction finding, navigation, sounding, etc., are not discussed in this section. Regarding the maintenance and repair of RF communication equipment, refer to original equipment manufacturer technical manuals, Coast Guard documentation, and CGPMS standards.

5.3.1.0.2 References

The following list of references may be used to expand the information covered in this section.

a. International Radio Advisory Committee (IRAC) Table
b. Telecommunications Manual, COMDTINST M2000.3 (series)
   http://cgweb.comdt.uscg.mil/g-sct/programs/m2000.3c/index.htm
c. Coast Guard Radio Frequency Plan, COMDTINST M2400.1 (series)
   http://cgweb.comdt.uscg.mil/g-sct/programs/m2400.1f/m2400.1f.htm
d. NWP 10-1-10
e. Navy EIB's, SO111-XX-EIB-XX (first XX is the year and the last XX is the EIB number.)
f. Navy EIMB, NAVSEA SE-000-00-EIM-XXX series. (Particularly SE000-00-EIM-120 of this set.)
g. TISCOM Website: http://cgweb.tiscom.uscg.mil/

5.3.1.0.3 Contents

This section contains the following topics:

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5.3.1.1 Frequency and Communications

5.3.1.1.1 Radio Frequency Communication Scope

The equipment covered herein operates over the frequency range of 250 kHz to 400 MHz. These frequencies are grouped by IRAC into frequency bands as follows:

- ?? 300 KHz to 3.0 MHz Medium Frequency (MF)
- ?? 3.0 MHz to 30 MHz High Frequency (HF)
- ?? 30 MHz to 300 MHz Very High Frequency (VHF)
- ?? 300 MHz to 3000 MHz Ultra High Frequency (UHF)

5.3.1.1.2 Frequency Classification

Because of frequencies used by the Coast Guard and common terminology adopted by radio operators, the IRAC designations have been modified in the Coast Guard as follows:

- ?? 250-525 kHz MF
- ?? 2.0-30.0 MHz HF
- ?? 118-175 MHz VHF
- ?? 225-400 MHz UHF

This latter system of banding, although not correct, helps to eliminate confusion when referring to transmitters that are capable of spanning two frequency bands. As an example, an AN/WSC-3 operating on 243 MHz is referred to as UHF rather than a VHF/UHF transceiver. This method of frequency classifying the equipment will be used throughout this section.

5.3.1.1.3 Frequency Tolerances

Frequency tolerance requirements vary with fixed or mobile use, frequency, and type of emission. For a general list of these tolerances refer to the IRAC Tables of Frequency Tolerances. Communications equipment used by Coast Guard units shall conform to current specifications and tolerances as directed by Commandant or other cognizant government agencies.

5.3.1.1 Frequency and Communications, Continued

5.3.1.1.4 Audio Frequency Communication Equipment

Audio frequency communications includes Interior Communications (IC) systems (less sound powered phones), Public Address (PA) systems, Telephone Systems, and Carrier Equipment used over landlines. With regard to maintenance and repair of AF communication equipment, refer to original equipment manufacturer technical manuals, Coast Guard documentation, and CGPMS standards.

5.3.1.1.5 Communication and Computers

Computer systems carry much of the operational message traffic in the Coast Guard. Other computers interface with radio communications equipment for various purposes such as programming, diagnosing, monitoring, controlling, routing message traffic, or storing data. These systems interface with various other communications systems. In a shipboard environment, message traffic may originate on a standard workstation-type computer, but actually be transmitted from the ship on a radio frequency circuit. There is no standard dividing line between administrative computers and operational computers. Increasingly, though, computers are used for both without changing their fundamental nature, or their maintenance philosophy.

5.3.1.2 Definitions and Acronyms

5.3.1.2.1 Common Terms and Definitions	The following is a list of common communication systems or modes of communication used in the Coast Guard, and these brief descriptions are provided to familiarize technicians with these terms.
5.3.1.2.2 OTCIXS	Officer in Tactical Command Information Exchange System
5.3.1.2.3 CUDIX	Common User Digital Exchange
5.3.1.2.4 NAVMACS	Naval Modular Automated Communication System
5.3.1.2.5 NAVTEX	Navigation Telex Radio. A navigational warning system used to broadcast Notice to Mariners, weather warning messages, and other maritime information over the internationally designated frequency of 518kHz by automatic printout from a dedicated receiver.
5.3.1.2.6 SITOR	Simplex teletype over radio
5.3.1.2.7 DAMA	Demand Assigned Multiple Access – Navy satellite communications system
5.3.1.2.8 EPSBRT	Enhanced Portable Satellite Broadcast Receive Terminal
5.3.1.2.9 GMDSS	Global Maritime Distress and Safety System
5.3.1.2.10 DSC	Digital Selective Calling
5.3.1.2.11 ALE	Automatic Link Establishment
5.3.1.2.12 HFDL	High Frequency Data Link

5.3.1.2.13 TEMPEST	TEMPEST is an unclassified short name referring to investigations and studies of unintentional signals that, if intercepted and analyzed, would disclose the information transmitted, received, handled, or otherwise processed by telecommunications or automated information systems equipment. TEMPEST-Certified equipment or systems comply with the national requirements of NSTISSAM TEMPEST/l-92 Level I or previous editions. Through a vigorous application of the TEMPEST program, the Coast Guard can protect National Security Information. For information on TEMPEST, see reference MIL-HDBK-232A(1), RED/BLACK ENGINEERING-INSTALLATION GUIDELINES
5.3.1.2.14 MARS	Military Affiliated Radio System
5.3.1.2.15 CGDN+	Coast Guard Data Network Plus
5.3.1.2.16 LINK-11	A Navy tactical communication system
5.3.1.2.17 SATCOM	Satellite Communications
5.3.1.2.18 COMSTCOM	Commercial Satellite Communications
5.3.1.2.19 MILSATCOM	Military Satellite Communication
5.3.1.2.20 INMARSAT	International Maritime Satellite ?? INMARSAT A - Voice-Only Analog ?? INMARSAT B - Digital voice and data ?? INMARSAT C - Digital data only. Store and send ?? INMARSAT Mini-M - Digital voice and data
5.3.1.2.21 NDRS	National Distress and Response System

5.3.2 Aids to Navigation

5.3.2.0.1 Overview

This section contains administrative and technical information for aid-to-navigation systems used on Coast Guard cutters, boats, and shore stations. This section is organized into sections describing Vessel Traffic Service (VTS) System, Long Range Navigation System (Loran), Short Range Aids to Navigation (SRAN) systems and Differential Global Positioning System (DGPS) that are used by the Coast Guard. It contains general information regarding equipment requirements, system capabilities, installation, and maintenance guidelines. Specific information is provided via references or hyperlink. This information does not replace or supercede information provided in any technical manual. The intent is to supplement existing manuals.

5.3.2.0.2 References

The following list of references may be used to expand the information covered in this chapter:

a. Aids to Navigation Manual – Technical, COMDTINST M16500.3 (series)
b. Federal Radio Navigation Plan
c. C2CEN website http://c2cen.uscg.mil, (internet) http://cgweb.c2cen.uscg.mil (intranet) (check URL's)
d. Loran website: http://www.uscg.mil/hq/lsu/webpage/lsu.htm
e. SRAN website: http://cgweb.comdt.uscg.mil/g-sce/sce-2/SRAN.htm

5.3.2.0.3 Contents

This section contains the following topics:

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5.3.2.1 Vessel Traffic Service (VTS) System

5.3.2.1.0.1 Overview

This section contains administrative and technical information for Coast Guard Vessel Traffic Service (VTS) System and contains general information regarding equipment requirements and system capabilities. Specific information is provided via references or hyperlink. This information does not replace or supercede information provided in any technical manual. The intent is to supplement existing manuals.

5.3.2.1.0.2 References

The following list of references may be used to expand the information covered in this chapter:

a. C2CEN website http://c2cen.uscg.mil, (internet) http://cgweb.c2cen.uscg.mil (intranet) (check URL's)

5.3.2.1.1 System Description

The Vessel Traffic Service System is designed to enhance the Coast Guard's ability to monitor and provide advisories to vessels in specific ports. A secondary purpose for VTS Systems to provide the capability to document traffic incidents and conditions for later analysis. The following is a basic block diagram of the VTS System.

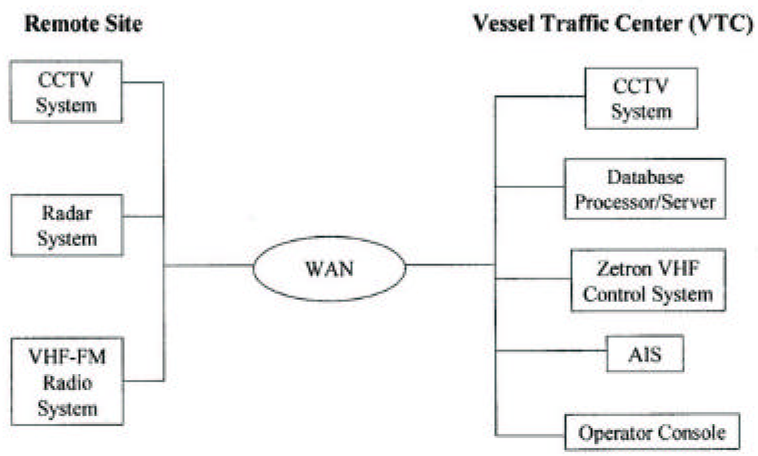

Figure 5.3.2-1 Vessel Traffic Service (VTS) System Basic Block Diagram

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5.3.2.1.1 System Description, Continued

There are two distinct components of the VTS System, the Remote site and the Vessel Traffic Center (VTC). Each VTS system may consist of up to 24 remote sensor sites providing radar, Automated Identification System (AIS) information, surveillance video and VHF-FM voice communications to the Vessel Traffic Center (VTC). Each remote site is modularly configured with some or all of the previously mentioned sensors as deemed necessary. The remote site transmits this information to the VTC via either commercial or CG owned wide area network (WAN). At the VTC, sensor data from each of the remote sites is received and distributed to the appropriate equipment/subsystem via a local area network (LAN). Subsystem data is integrated in a main database processor/server and sent to the operator consoles. This allows the operator to monitor, identify and correct potentially dangerous vessel traffic conditions.

5.3.2.1.2 VTS Equipment

There are four main equipment sub-systems associated with VTS:

a. Radar Sub-system: Furuno radars are used wit Hughes, Telephonics or the AN/SPS-73(V) Surface Search Radar (SSR) processors to monitor vessel traffic and anchorages.
b. VHF Radio Sub-System: Motorola Quantar receivers/transceivers are used to monitor vessel communications and to pass on any advisories.
c. Closed Circuit Television (CCTV) Sub-System: Pelco CCTV cameras are used in conjunction with the radar system to provide vessel identification.
d. Automated Identification System (AIS) Sub-System: The Ross AIS system allows vessel information to be automatically broadcast to other vessels capable of receiving the information.

5.3.2.1.3 Maintenance Levels

Maintenance of VTS electronic equipment is organized into four levels: (1) organizational, (2) intermediate, (3) depot, and (4) SMEF.

1. **Organizational** - Maintenance consists of preventive and corrective maintenance and is performed by assigned unit personnel and applicable Electronics Support Detachment (ESD) or contractors.
2. **Intermediate** - Maintenance consists of corrective maintenance beyond the capability of the assigned organizational level is performed by applicable Maintenance and Logistics Command (MLC) and/or their subordinate units, and contractors.
3. **Depot** - Maintenance consists of the repair and stocking of modules, assemblies, and components used in the VTS system. The Command and Control Engineering Center performs depot level maintenance via commercial contract.

Continued on next page

5.3.2.1.3 Maintenance Levels, Continued

4. **SMEF** - The Command and Control Engineering Center is the SMEF for VTS and provides ‘last stop’ technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels. SMEF responsibilities consist of resolution of System Trouble Reports (STR’s), System Improvement Reports (SIR’s), Engineering Change Proposals (ECP’s), development of field changes, and overall system engineering. The Command and Control Engineering Center (C2CEN) performs SMEF maintenance for VTS.

5.3.2.2 Long Range Navigation (Loran) System

5.3.2.2.0.1 Overview

This section contains administrative and technical information for the Long Range Navigation (Loran) system. It contains two sections. This first section contains general information regarding equipment requirements and system capabilities. The second section covers equipment description and maintenance. This section does not replace any technical manual. The intent is to supplement existing manuals.

5.3.2.2.0.2 References

The following list of references may be used to expand the information covered in this chapter.

a. Aids to Navigation Manual – Technical, COMDTINST M16500.3 series
b. Specification of the Transmitted LORAN-C Signal, COMDTINST M16562.4 (series)
c. LORAN-C Users Handbook, COMDT PUB16562.6 (series)
d. Federal Radio Navigation Plan (current edition)
e. Tower Manual, COMDTINST M11000.4 (series)
f. LORAN-C Operations Manual, NAVCENINST M16562.1 (series)
g. All applicable equipment technical manuals & operations guides found on the Loran Support Unit (LSU) web page (http://www.uscg.mil/hq/lsu/webpage/lsu.htm).

5.3.2.2.0.3 Contents

The Loran section contains the following topics:

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5.3.2.2.1 LORAN System Description

5.3.2.2.1.1 System Description

LORAN-C is a radio aid to navigation, which operates in the frequency spectrum of 90 to 110 kHz with a carrier frequency of 100 kHz. Although primarily used for navigation, LORAN-C transmissions may also be used for timing and frequency reference and communication purposes. LORAN-C consists of 29 transmitting stations arranged in groups, forming LORAN-C chains. At least three transmitting stations make up a chain. One transmitting station is designated as Master while the others are called secondaries. Chain coverage is determined by the power transmitted from each station, the distance between them, and their orientation. Hyperbolic radio navigation aids operate on the principle that the difference of the time of arrival of signals from two stations, observed at a point in the coverage area, is directly proportional to the difference in distance from the point of observation to each of the stations.

A typical LORAN-C chain consists of a master (M) and four secondary stations (W, X, Y, and Z). Some stations may operate as dual-rated ((functioning as two stations, each on a different rate) and others as single- rated (functioning as a single station. For specific rate information, refer to the LSU web page found in Block 5.3.2.2.0.2 part g. The precisely timed pulse transmissions from all stations are on a time-shared basis, using the common carrier frequency of 100 kHz. The master station broadcasts a series of pulses. Secondary station (W) waits a precise interval (coding delay) and then transmits a series of pulses, followed by the other secondary stations in sequence (X, Y, Z). The time elapsed between the initiating pulse from the master and the next initiating pulse from the same master is known as the group repetition interval (GRI). Each LORAN-C chain is designated by a unique GRI. The transmitted signals from the master and secondary stations are monitored by a series of remote monitor sites, or Primary Control Monitor Sets (PCMS), located within the chain coverage area and relayed via data communication links to the control stations, which contain a manned LORAN-C Consolidated Control System (LCCS), located at NAVCEN and NAVCEN Detachment.

5.3.2.2.2 LORAN-C Transmitting Stations, PCMS Sites, Control Stations

5.3.2.2.2.1 Overview

The primary mission of the LORAN-C transmitting station is to develop and transmit the LORAN-C signals to the user service area. There are presently 29 transmitting stations located in the United States and Canada. See the LSU web page (Block 5.3.2.2.0.2, part g) for a list of Loran transmitting stations. Each transmitting station consists of a high power transmitter, timing and frequency equipment (TFE), and communications, control, and monitoring (CCM) equipment. Real time LORAN-C signal data is captured at the PCMS sites. The LCCS monitors and controls the parameters of the transmitted signal, by analyzing and relaying signal and control data between the transmitting stations and the PCMS sites.

5.3.2.2.2.2 High Power Transmitting Equipment

The LORAN-C transmitting equipment consists of two types of high-power transmitters, the tube-type and the solid state. The tube-type transmitters were developed and installed in the 1960s. They contain mostly discrete components and require significant onsite maintenance. The solid-state transmitters were mostly developed and installed in the late 1970s and 1980s. These transmitters consist of a modular design and contain mostly depot repairable circuit assemblies. For specific information on each type of high-power transmitter, refer to the appropriate technical manual or operations guide on the LSU web page (Block 5.3.2.2.0.2, part g).

5.3.2.2.2.3 Timing and Frequency Equipment (TFE)

The timing and frequency equipment (TFE), formerly known as timing and control equipment (TCE), develops and shapes the LORAN-C pulse, provides timing and frequency stability, and provides for remote control of the transmitted signal. For specific information on the TFE, see the appropriate technical manual or operations guide on the LSU web page (Block 5.3.2.2.0.2, part g).

5.3.2.2.2.4 Communications, Control, and Monitor Equipment (CCM)

The communications, control and monitoring (CCM) equipment communicates, controls and monitors the high power transmitting equipment, and the TFE. The CCM equipment provides for local control of all transmitting station parameters. The CCM equipment also relays real-time LORAN-C signal data and station alarms to the LORAN-C Consolidated Control System (LCCS), located at NAVCEN and NAVCEN Detachment. For specific information on the CCM equipment, refer to the CCM Operator's Guide on the Loran Support Unit web page.

5.3.2.2.2.5 Primary Control Monitor Set (PCMS)

The primary purpose of the PCMS is to supply real-time LORAN-C signal data to the LCCS, located at NAVCEN and NAVCEN Detachment. The PCMS is located at a remote monitor site in a critical LORAN-C user area. The primary piece of equipment in the PCMS is a highly accurate linear averaging digital LORAN-C monitor receiver, which is capable of tracking multiple LORAN-C chains. The remaining equipment in the PCMS provides remote communications and backup power to the equipment. For specific information on the PCMS equipment, refer to the Primary Chain Monitor Set Operator's Guide on the LSU web page (Block 5.3.2.2.0.2, part g).

5.3.2.2.2.6 LORAN-C Consolidated Control System (LCCS)

The primary purpose of the LCCS is to remotely monitor chain operations and control the parameters of the transmitted signal from the Control Station (CONSTA). The LCCS analyzes and relays signal and control data between the transmitting stations and the PCMS sites and controls the parameters of the transmitted signals. The LORAN-C signal data is received from the PCMS sites and transmitting stations via data links. This data is maintained and analyzed using the LCCS located at NAVCEN and NAVCEN Detachment. For specific information on the LCCS equipment, refer to the LORAN-C Consolidated Control System Operator's Guide on the LSU web page (Block 5.3.2.2.0.2, part g).

5.3.2.2.3 Maintenance of LORAN-C System Equipment, PCMS Sites, Control Stations

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5.3.2.2.3.1 Maintenance Philosophy

Maintenance of LORAN-C electronic equipment is organized into four levels: (1) organizational, (2) intermediate, (3) depot, (4) and SMEF. The maintenance philosophy varies slightly between the transmitting stations, monitor, and control sites.

5.3.2.2.3.2 LORAN-C Transmitting Stations maintenance levels

1. **Organizational –** Assigned personnel at the transmitting station perform organizational level of preventive and corrective maintenance at the transmitting stations.
2. **Intermediate –** Intermediate level maintenance performed at the transmitting stations consists of corrective maintenance beyond the capability of the assigned personnel, and is performed by the LSU.
3. **Depot –** Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used at the transmitting stations. The ELC performs all assigned depot level maintenance.
4. **SMEF –** The LSU is the SMEF for all Loran systems and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels.

5.3.2.2.3.3 Timing and Frequency Control Equipment (TFE) Maintenance Levels

1. **Organizational –** Assigned personnel at the transmitting station perform organizational level of preventive and corrective maintenance at the transmitting stations.
2. **Intermediate –** Corrective maintenance performed on the TFE at the transmitting stations, that is beyond the capability of the assigned personnel, and is performed by the LSU.
3. **Depot –** Maintenance consists of the repair and stocking of modules, assemblies, and components used in the Loran system. The ELC performs all assigned depot level maintenance.
4. **SMEF –** The LSU is the SMEF for the TFE sites and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate level.

5.3.2.2.3.4 Communications, Control, and Monitor Equipment (CCM) maintenance levels

1. **Organizational –** Assigned personnel at the transmitting station perform organizational level of preventive and corrective maintenance at the transmitting stations.
2. **Intermediate –** Corrective maintenance performed on the CCM at the transmitting stations, that is beyond the capability of the assigned personnel, and is performed by the LSU.
3. **Depot –** Maintenance consists of the repair and stocking of modules, assemblies, and components used in the Loran system. The ELC performs all assigned depot level maintenance.
4. **SMEF –** The LSU is the SMEF for the CCM and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate level.

5.3.2.2.3.5 Primary Control Monitor Sets (PCMS) maintenance levels

1. **Organizational –** PCMS sites are remotely located with no ETs assigned. MLCA/P and/or its subordinate units (ESU/ESD) or contractors are responsible for organizational level support. NAVCEN and NAVCEN Detachment are responsible for notifying the maintenance facility that a failure has occurred.
2. **Intermediate –** Intermediate level maintenance at the PCMS sites consists of preventive and corrective maintenance and is performed by the applicable Maintenance and Logistics Command (MLC) and/or its subordinate units (ESU/ESD). Some PCMS sites are located at commercial airports and are maintained by FAA technicians or their contractor.
3. **Depot –** Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used in the Loran system. The ELC performs all assigned depot level maintenance.
4. **SMEF –** The LSU is the SMEF for the PCMS sites and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate level.

5.3.2.2.3.6 Consolidated Control System (LCCS) maintenance levels

1. **Organizational –** Organizational level maintenance at the LCCS sites consists of preventive and corrective maintenance and is performed by NAVCEN or NAVCEN Detachment.
2. **Intermediate –** Intermediate level maintenance at the LCCS sites consists of corrective maintenance beyond the capability of the assigned organizational level and is performed by the LSU.
3. **Depot –** Depot level maintenance consists of the repair and stocking of modules, assemblies and components used in the LCCS. Depot level maintenance is provided under commercial contract administered by the LSU.
4. **SMEF –** The LSU is the SMEF for the LCCS sites and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate level.

5.3.2.3 Short Range Aids to Navigation (SRAN)

5.3.2.3.0.1 Equipment Requirements

The Short Range Aids to Navigation (SRAN) program develops and deploys equipment used to navigate near the shoreline. This equipment provides navigational coverage from 1 to 30 miles. Most of this equipment is placed at sites where boaters operate 24 hours a day, year round with only a few aids where the equipment is used seasonally. The SRAN equipment operates using alternating current from generators or commercial power or direct current from batteries or solar panels. The equipment operates in environments where the temperature and humidity are unregulated. Some SRAN equipment that emits signals is subject to Military Standard testing i.e. MIL-STD-462, MIL-STD-461 and MIL-STD-810. This information does not replace or supercede information provided in any technical manual. The intent is to supplement existing manuals.

5.3.2.3.0.2 Contents

The SRAN section contains the following topics:

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5.3.2.3.1 General SRAN information

5.3.2.3.1.1 System Capabilities

The SRAN systems capabilities are used at some sites to control and monitor Lighthouses, and Ranges. Some of the functions that can be controlled or monitored at these sites are lights, sound signals, and power.

5.3.2.3.1.2 Installation Planning

All new or replacement SRAN electronic systems installations should be coordinated by the MLCs. Commandant (G-SCE)-2 is the primary contact when a new or replacement SRAN installation is required. Commandant (G-SCE)-2 will forward all electronic installation requests to the Headquarters program sponsor, C2CEN, ELC, Commandant (G-SEC) and Commandant (G-SCT) if required for review and approval.

5.3.2.3.1.3 Frequency Assignments

Currently, Commandant (G-SCT-2) has earmarked five frequencies for use in the automation program. Four are in the 406-420 MHz Government UHF/FM band and will be allocated on an individual basis. The specific frequencies are:

?? 407.625,
?? 407.975,
?? 415.625 and
?? 415.825 MHz.

Since the monitor systems are designed for simplex operation, only one frequency is used with each group unless a repeater station is involved. If interference is expected due to more than one group using radios in the same region, then different frequencies will be assigned. The fifth frequency is 165.31250 MHz in the VHF/FM band for use where longer links exist (not currently in use). While these five frequencies have been assigned to the Coast Guard, clearance must be obtained from the Interdepartmental Radio Advisory Committee (IRAC) for use at a particular location. Therefore, after the antenna installation planning is complete for a particular automated station, each MLC/district commander (e) shall submit the following information to Commandant (G-SCT-2) to permit filing the radio frequency request:

Continued on next page

5.3.2.3.1.3 Frequency Assignments, Continued

- Station location (city and state), ant. lat/long, ant. type-transmit site.
- Station location (city and state), ant. lat/long, ant. type-receive site.
- Height of antenna at transmits and receives sites broken into two parts: height of land at station location above mean low water (in case of the Great Lakes, height above lake level) and height of antenna above land.
- Date when operation will commence.

More information can be found in the USCG Radio Frequency Plan, COMDTINST M2400.1 (series).

NOTE:

This information should be submitted at least 90 days prior to the first transmission.

5.3.2.3.1.4 Maintenance Guidelines

Aids to Navigation Teams and/or A-76 Contractors normally provide organizational (field) level support for the repair and maintenance of SRAN equipment within their areas of responsibility. The ANT or A-76 Contractor shall request additional logistical or technical assistance from their local ESU or ESD for electronic SRAN failures or discrepancies that exceed their resource capabilities. In some cases, the servicing ESU or ESD may provide direct organizational (field) level maintenance support. In either case, the ESU or ESD will request assistance from the cognizant MLC electronics support branch for any electronic or logistics problems, or requests for assistance from the field, that may exceed their resource capabilities. The MLC electronics support branch will assist with repair efforts, or direct repair personnel to contact the Command and Control Engineering Center (C2CEN) for additional assistance. Repair personnel may also be advised to contact the Engineering Logistics Center (ELC) for depot level support and equipment logistics. Repair personnel should contact Headquarters (Commandant (G-SCE)) Electronic Division for any SRAN problems or issues, which are outside the scope of support provided by either C2CEN or ELC.

Continued on next page

5.3.2.3.1.4 Maintenance Guidelines, Continued

Available Service Contacts:

C2CEN	http://cgweb.lant.uscg.mil/c2cen/fr_in.htm	757 686-2156
ELC	http://cgweb.elcbalt.uscg.mil/default.htm	410 762-6688
HQ	http://cgweb.comdt.uscg.mil/g-sce/sce-2/	202 267-1271

The electronic equipment maintenance goal at an automated lighthouse is three months without failure. Naturally in an emergency, corrective action must be taken at once. Weather is a factor that may influence the maintenance schedule. The following guidelines can be used:

?? Specific guidelines for all SRAN equipment maintenance should covered under EILSP documents written and maintained by C2CEN.

?? Any loss of monitor information due to link or remote monitor failure may not reflect a loss of service to the mariner but does create a lack of confidence at the master station and must be CASREPED if not repaired within 24 hours.

?? Occasional losses of the communications link may be caused by thunderstorms, thermal inversions or telephone lines. Before a technician is sent to the remote site every possible effort should be made to verify that the problem does, in fact, exist at the remote site. ACMS provides a direct indication of the problem on the status page for the aid.

In situations where a boat or helicopter crew is standing by for a technician to effect repairs, every effort should be made to expedite the process. A parts control system should be instituted to insure that all modules are repaired and returned to the proper locations.

5.3.2.3.2 AN/USQ-91(V) Aid Control-and Monitor System, (ACMS)

5.3.2.3.2.1 History

The Aid Control Monitor System (ACMS) is the newest monitor and was designed for the Coast Guard by the John Hopkins University, Applied Physics Lab and was built by AVW Electronic systems, Inc. in Inglewood, CA.

5.3.2.3.2.2 Equipment

This equipment consists of three parts,

- ?? Control Display Group
- ?? Interconnecting Group
- ?? Monitor Group (MG)

5.3.2.3.2.3 System Description

The Control Display Group contains a specifically modified desktop personal computer. This unit displays the status of up to 32 monitored functions and allows the control of 8 functions at each unmanned station. The AN/USQ-91(V) system allows a single operator, at the Control Display Group, to maintain constant surveillance and control of a maximum of twenty-four remote stations. The equipment groups, which comprise ACMS, are designed for mounting in a 19”electronic equipment rack. The Monitor Group and the Interconnecting Group occupy three feet of vertical space in a 24” deep equipment rack. Several components make up each group. Most of the components are the same from group to group. Power supplies differ depending upon whether AC or DC power will be used. The printed circuit (PC) boards, although the same, differ in the way they are jumpered. The microprocessor board is programmed differently for the Remote Unit (RU) and Transfer Unit (TU), although it is the same board. The following are system components comprise the AN/USQ-91(V):

a. OA-9211(V)/USQ-91(V) Monitor Group, DC Remote Unit(RU)
b. OA-9211(V)3/USQ-91(V) Monitor Group, AC Remote Unit(RU)
c. ON-267(V)1/USQ-91(V) Interconnecting Group, Transfer Unit (TU)
d. GCF-W-1204/USQ-91(V) Control Display Group, Master Unit (MU)

5.3.2.3.2.4 ACMS Installation Locations

The Coast Guard will install Master Units (MUs) in locations where 24-hour watches are maintained, typically Coast Guard Operation Centers. Remote Units (RUs) will reside at automated aids. Phone links, radio links or combination radio/phone links will connect the RUs and the MUs. When distances between the RU and MU exceed radio link capabilities a Transfer Unit (TU) will be utilized. Figure5.3.2-2 (shown below) provides a simplified block diagram of the ACMS.

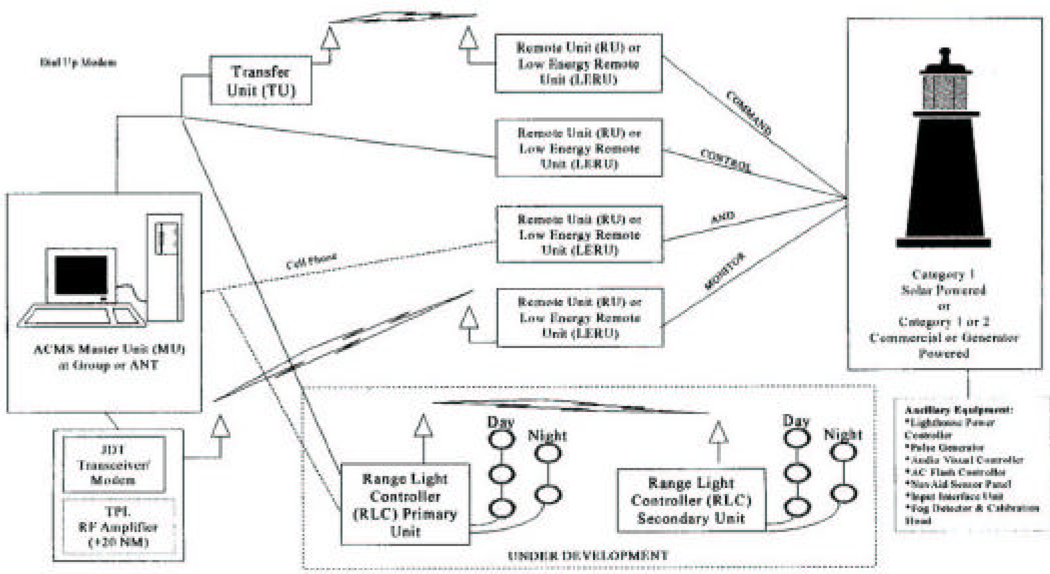

Figure 5.3.2-2 Aid Control and Monitor System (ACMS)

5.3.2.3.2.5 ACMS Operations

The watch stander monitors the MU. It provides him or her with information about the aids being monitored. The current configuration calls for monitoring the primary, secondary and emergency lights and sound signal, the power system, the fog detector and intrusion or fire at the aid. The MU at the watch stander's station displays this information. The MU will reflect any changes that the RU reports, and will generate an alarm display if appropriate.

5.3.2.3.2.6 Maintenance Level

Organizational - Maintenance is limited to replacing modules, subassemblies, and the mainframe components. Some replaceable modules in these equipments are designated XB and are not to be repaired by the servicing unit. Upon failure of an XB designated module, a replacement will be requisitioned from the ELC. The defective module will be returned in accordance with instructions received with the replacement module or as may be directed by the support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/.

ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to modules, which may be replaced at the organizational level. XB designated items will be listed in the APL without a breakdown of component parts. Spare parts kits for the RU and TU equipment was furnished at initial issue to units with maintenance responsibility. The RU and TU spare parts kits consists of one of each type of PC card utilized, a power supply, OPTO 22 modules and miscellaneous parts. Replenishment of spare parts other than XB material shall be through the use of normal MILSTRIP procedures, Refer to CGPMS procedures and ACMS technical manuals for further maintenance guidance.

5.3.2.3.3 GCF-RWL-2241 NAVAID Sensor Panel

5.3.2.3.3.1 History

The NAVAID Sensor Module was designed and tested by the Coast Guard and manufactured by Fidelity Technology in Reading PA.

5.3.2.3.3.2 Equipment

GCF-RWL-2241	NAVAID SENSOR PANEL
GCF-RWL-2076	NAVAID MODULE

5.3.2.3.3.3 System Description

The NAVAID Sensor Module is a small gray box approximately 12 inches square with two PC cards used to monitors and control the operation of the Light and Sound Signals. The complete system weighs about 10 lbs.

5.3.2.3.3.4 Installation and Locations

The Coast Guard installs NAVAID Sensor Modules at locations where 24-hour Light or Sound Signal control and monitoring is required, typically at Coast Guard Lighthouses.

5.3.2.3.3.5 Operation

The NAVAID Sensor Panel is used to interface the aid (light or sound signal) with the monitor and control equipment. The panel contains two NAVAID Sensor Modules (light and sound) plugged into edge connectors that fold out to facilitate testing and repair. The NAVAID Sensor Module performs the following functions:

?? Converts contact closures originating from the aid to navigation into suitable signals to interface with the remote monitor equipment.

?? Continuously monitors the operation of the light or sound signals in the aid to navigation system to ensure that they are "active" when required.

?? Automatically switches the aid to navigation into the secondary mode in the event of a primary signal failure and into emergency operation when both primary and secondary have failed.

5.3.2.3.3.6 Maintenance

Upon failure of an XB designated module, a replacement will be requisitioned from the ELC. The defective module will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to modules, which may be replaced at the organizational level. XB designated items will be listed in the APL without breakdown of component parts.

5.3.2.3.4 CEVV-VM100 Fog Detector

5.3.2.3.4.1 History	The VM100 Fog Detector was designed, tested and manufactured by Fidelity Technology in Reading PA. The Coast Guard also tested the sensor with the assistance of the National Weather Service in Steeling VA. Coast Guard Engineering Facility, C2CEN developed software and hardware changes to the Fog Detector in 2001 to improve operational reliability.
5.3.2.3.4.2 Equipment	CEVV-VM100 Fog Detector
5.3.2.3.4.3 System Description	The Fog Detector is a small white box approximately 18 inches square that is mounted to a 6-foot pedestal with 6 PC cards used to monitors and control the operation of Sound Signals. The complete system weighs about 60 lbs. The electronics box has two tubes mounted on the front surface that transmits and receives visible light, which is reflected off the atmosphere and measured to indicate visibility in nautical miles.
5.3.2.3.4.4 Installation and Locations	The Coast Guard Fog Detectors are located where 24-hour Sound Signal control and monitoring is required, typically at Coast Guard Lighthouses.

5.3.2.3.4.5 Operation

The Fog Detector is used to interface with the aid (sound signal) and other monitoring and control equipment. This system measures visibility and provides on/off control of the local sound signal. It also reports the operational status of the Fog Detector to the CG ACMS Remote monitoring system. The alarm signal is utilized by the NAVAID Sensor Module to control sound signals and provide a status signal to the ACMS Remote monitoring equipment. Where there is no NAVAID Sensor Module installed, the fog detector is connected directly to the sound signal. The sensor contains three plugs to facilitate testing and repair. The watch stander monitors any failures of the Fog Detectors from the ACMS Master Unit. It provides him or her with information about the primary, secondary and emergency sound signal, at the aid and if the Fog Detector is on/off or failed. The Fog Detector performs the following functions:

?? Operates-contact closures to control the sound signal on and off during low visibility.
?? Operates contact closures to indicate alarm conditions to the remote monitor equipment.
?? Provides a failure safe operation to turn on the primary, secondary and emergency sound signal if failed.

5.3.2.3.4.6 Maintenance

This electronics box is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.5 CEVV-LPC Lighthouse Power Controllers

5.3.2.3.5.1 History

The Lighthouse Power Controllers were designed and tested by the Coast Guard and manufactured by Fidelity Technology in Reading, PA.

5.3.2.3.5.2 Equipment

CEVV-LPC-20032 CONTROLLER

CEVV-LPC   RELAY SWITCH BOX

5.3.2.3.5.3 System Description

The Lighthouse Power Controller is a combination of two gray boxes approximately 24 inches square. The LPC contains 5 PC cards used to monitor~~s~~ and control the application of either commercial or generator power, by controlling the relays in the Relay Switch Box. The complete system weighs about 100 lbs.

5.3.2.3.5.4 Installation and Locations

Lighthouse Power Controllers are located where 24-hour AC power control and monitoring is required, typically at Coast Guard Lighthouses.

5.3.2.3.5.5 Operation

Lighthouse Power Controllers are used on aids to navigation sites to monitor parameters of the primary power sources and switch to the secondary if the primary fails or is out of tolerance for a preset length of time. If the secondary should fail or stay out of tolerance, the controller will shut it down. The system will then have to be reset after the failure conditions have been corrected. The controllers also have provisions for exercising the secondary generator remotely and providing system status information to the ACMS remote monitoring equipment

5.3.2.3.5.6 Maintenance

This electronics box is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.6 GCF-RWL-2098 Audio Visual Controllers (AVC)

5.3.2.3.6.1 History	The Audio Visual Controllers were designed and tested by the Coast Guard and manufactured by Fidelity Technology in Reading PA.
5.3.2.3.6.2 Equipment	GCF-RWL-2098 AUDIO VISUAL CONTROLLER
5.3.2.3.6.3 System Description	The Audio Visual Controller is one gray box approximately 24 inches square. The box contains 2 PC cards used to monitor and control the operation. It also has circuit breakers installed to isolate all power going to each system in the aid. There are timers installed in this box to turn off all the equipment if the commercial power is lost and the DC power drops below the operational set point. The complete system weighs about 40 lbs.
5.3.2.3.6.4 Installation and Locations	The Audio Visual Controllers are located where 24-hour control and monitoring is required, typically at Coast Guard Lighthouses.
5.3.2.3.6.5 Operations	The Audio Visual Controller (AVC) interfaces the power and signal data for various aids to navigation equipments. The AVC is used with all standard category I, II, and III light and sound signal systems.
5.3.2.3.6.6 Maintenance	This electronics box is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.7 GCF-RWL-2106 AC Flash Controllers (ACFC)

5.3.2.3.7.1 History	The AC Flash Controllers were designed and tested by the Coast Guard and manufactured by Delta Integration in Lancaster, PA.
5.3.2.3.7.2 Equipment	GCF-RWL-2106 AC FLASH CONTROLLER
5.3.2.3.7.3 System Description	The AC Flash Controller is one gray box approximately 18 inches square. The box contains 1 PC board used to monitor and control the operation. It also has 2 circuit breakers installed to isolate power going to each lights at the aid. The complete system weighs about 20 lbs
5.3.2.3.7.4 Installation and Locations	The AC Flash Controllers are located where 24-hour control is required, typically at Coast Guard Range Lights.
5.3.2.3.7.5 Operation	The AC Flash Controller (ACFC) provides daylight control of the main light and interfacing a main light of up to 1,000 watts at 120 VAC to be controlled by the ACFC's internal CG-181 flasher.
5.3.2.3.7.6 Maintenance	The equipment is repairable at the intermediate level. There are no XB designated materials contained within the ACFC. Defective components may be discarded. The ACFC contains a voltage adjustment in the power supply. It is located inside the enclosure directly under the silver hole plug which is in the center of the front cover of the power supply. The voltage is measured on the + and – terminals of the CG-181 and is set to a voltage suitable for the CG-181 in use. Usually a voltage of 12 to 13 volts will insure proper operation. Solid-state relays, when subjected to gross overloads, usually short through. This will give a continuously ON main light. The relay is conservatively rated for its application and should shorting relays be a problem, a faulty load or associated wiring is generally the cause.

5.3.2.3.8 CDSA-IBC Battery Chargers

5.3.2.3.8.1 History	The Battery Chargers were designed, tested and manufactured by Sab Nife and Saft Nite.
5.3.2.3.8.2 Equipment	CDSA-IBC-12-30A 12 Volt Battery Charger CDSA-IBC-24-10A 24 Volt Battery Charger
5.3.2.3.8.3 System Description	The-12 and 24 VDC battery chargers are used in automation of aids to navigation systems to charge lead-acid and nickel-cadmium batteries.
5.3.2.3.8.4 Installation and Locations	The Battery Chargers are located where 24-hour battery control is required, typically at Coast Guard Lighthouses.
5.3.2.3.8.5 Operation	There is no organizational level maintenance. Intermediate level maintenance is limited to replacement of mainframe components, the printed circuit card and to equipment adjustment.
5.3.2.3.8.6 Maintenance	This system is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.9 CFAF-SEABEACON RACON

5.3.2.3.9.1 History	RACONs , RAdar beaCONs, were designed, tested, and manufactured by Tideland Signal Corporation of Houston, TX.
5.3.2.3.9.2 Equipment	CFAF-SEABEACON RACON
5.3.2.3.9.3 System Description	The RACON assembly is an integrated system comprised of a base housing/chassis, usually formed of aluminum or polycarbonate construction and containing the electronic circuitry, and a polycarbonate structural foam radome. The radome, which contains and protects the antennas, is highly transparent to microwave energy. The exterior surface of the radome structural foam material is coated with a layer of white polyurethane enamel. The base housing/chassis and radome are attached together and sealed by means of an airtight O-ring. This arrangement protects the internal electronic assemblies from salt-water intrusion. The RACON assembly contains 8 printed wiring boards, 2 antennas and assorted frequency specific modules. The overall length of the RACON assembly measures approximately 32 inches and weighs 25 pounds.
5.3.2.3.9.4 Installation and Locations	These devices are generally located in the vicinity of important harbor entrances, on large navigational buoys, on some light stations and on some specific geographic landmarks important to navigation, such as islands, jetties, etc. RACONs are particularly useful in marking indistinct points of land, buoys in high traffic areas and channel boundaries under bridges.

5.3.2.3.9.5 Operation

A RACON is an all weather aid to marine navigation that responds to radar pulses in the marine 2900-3100 and 9300-9500 MHZ microwave bands. It is essentially a transponder that, when triggered by the reception of a surface-search radar pulse, transmits a Morse-coded response. The ship's radar receives the echo of its own pulse from the RACON's structure, plus a much stronger pulse a few microseconds later from the RACON's transmitter. The identifier, commonly known as "paint", is displayed on the PPI radially outward from the position of the RACON. The use of the term RACON shall be reserved for those radar transponders, which are collocated on an aid to navigation or are themselves aids to navigation. The Coast Guard operates and maintains combined X-band and S-band transponders, the functionality of which is housed together in one assembly. These devices offer the ability to be frequency agile, and respond to the first signal interrogation, whether S or X band.

5.3.2.3.9.6 Maintenance

This system is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.10 CDPD Sound Signals

5.3.2.3.10.1 History

The Sound Signal were designed, tested and manufactured by Automatic Power Inc, in Houston, TX.

5.3.2.3.10.2 Equipment

CDPD-CG-1000	SOUND SIGNAL POWER SUPPLY, AC
CDPD-ELG-300/02	SOUND SIGNAL EMITTER, AC, 2MI, 300HZ
CDPD-ELG-500/02	SOUND SIGNAL EMITTER, AC, 2MI, 500HZ
CDPD-FA-232	SOUND SIGNAL, DC, 0.5MI, 390HZ
CDPD-FA-232/02	SOUND SIGNAL, DC, 1MI, 390HZ
9010-0135	POWER MODULE
9055-0005	DRIVER ASSEMBLY
CDPD-SA-3C	SOUND SIGNAL, DC, 2MI, 390HZ
CDPD-SA-850/01	SOUND SIGNAL, DC, 0.5MI, 850HZ
CDPD-SA-850/02	SOUND SIGNAL, DC, 1MI, 850HZ
9010-0091	PROGRAM TIMER
9010-0061	POWER MODULE
9055-0025	DRIVER ASSEMBLY
CDPD-SA-850/04A	SOUND SIGNAL, DC, 2MI, 850HZ

5.3.2.3.10.3 System Description

The Sound Signals come in various shapes, sizes and sound levels. The sound signal enclosure contains 2 assemblies used to control and monitor the operation of the signal. There may be more then one signal “stacked” at a location to provide a longer-range audible signal. A complete system can weigh as much as 230 lbs.

5.3.2.3.10.4 Installation and Locations

Sound signals are installed to warn mariners of the proximity of an obstruction. They may be located near natural obstructions such as rocks and points of land or man-made obstructions such as breakwaters.

5.3.2.3.10.5 Operation

Sound signals transmit an audible tone to signal the proximity of a dangerous area. The mariner may identify the signal by comparing the timing of the signal to a chart or light list. Sound signals are collocated at aid to navigation sites or are themselves an aid to navigation.

5.3.2.3.10.6 Maintenance

The sound signal oscillator assemblies, power modules, driver assemblies and program timers are designated XB free issue and are not to be repaired by the servicing unit. Upon failure, a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the ELC Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.3.11 GCF-W-1201 RLC-CU Range Light Controllers

5.3.2.3.11.1 History	The Range Light Controllers has been under development by the Coast Guard since 1992. Presently C2CEN has a contractor developing software for a COTS controller to interface with part of the old design, which measures the light signals current. Final development, testing and installation are due in the summer of 2002.
5.3.2.3.11.2 Equipment	GCF-W-1201-RLC-CU RANGE LIGHT CONTROLLER
5.3.2.3.11.3 System Description	The Range Light Controller is a combination of two sets of gray boxes approximately 24 inches square. One box at each light contains a processor used to monitor and control the operation of the range light both front and rear. The complete system weigh is about 60 lbs.
5.3.2.3.11.4 Installation and Locations	The Range Light Controllers are located where 24-hour control and monitoring is required, typically at Coast Guard Range Lights.
5.3.2.3.11.5 Operation	The RLC controls the operation of high-power day/night range optics used to guide vessels entering a channel, harbor or other navigable waterway. The RLC directs day/night optics based on the time of day, visibility, and failure status. The RLC are designed to be remotely controlled and monitored by the Aid Control and Monitor System (ACMS)
5.3.2.3.11.6 Maintenance	This system is designated XB and is not to be repaired by the servicing unit. Upon failure a replacement will be requisitioned from the ELC. The defective assembly will be returned in accordance with instructions received with the replacement module or as may be directed by the Support Gram at http://cgweb.elcbalt.uscg.mil/docs/sptgram/. ELC is the Inventory Control Point (ICP) for logistics support. General-purpose electronic test equipment is required for maintenance of this equipment. APL and MICA support will be limited to the assembly, which may be replaced at the organizational level.

5.3.2.4 Differential Global Positioning System (DGPS)

5.3.2.4.0.1 Overview

This section contains administrative and technical information for the Differential Global Positioning System (DGPS). It contains general information regarding equipment requirements and system capabilities. This information does not replace or supercede information provided in any technical manual. The intent is to supplement existing manuals.

5.3.2.4.0.2 References

The following list of references may be used to expand the information covered in this chapter:

a. Aids to Navigation Manual - Technical, COMDTINST M16500.3 (series)
b. Differential Global Positioning System (DGPS) Navigation Service Concept of Operations, COMDTINST M16577.2 (series)
c. Navigation Plan (current edition)
d. Tower Manual, COMDTINST M11000.4 (series)
e. Civil Engineering Manual, COMDTINST M11000.11 (series)
f. Nationwide Differential Global Positioning System (NDGPS) Interagency Memorandum of Agreement of 23 February 1999 All applicable equipment technical manuals & operations guides
g. C2CEN website http://c2cen.uscg.mil, (internet) http://cgweb.c2cen.uscg.mil (intranet) (check URL's)
h. NAVCEN website http://www.navcen.uscg.gov/ (internet) http://cgweb.navcen.uscg.mil (intranet) check URL's)

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5.3.2.4.1 Equipment Information

5.3.2.4.1.1 System Description

The primary purpose of the Differential Global Positioning System is to provide mariners with reliable position accuracy of better than 10 meters (2drms – about 95% of the time) when navigating in harbor and harbor approach areas of the continental US, Alaska, Hawaii, and Puerto Rico. A nationwide expansion to the DGPS system will provide DGPS signal coverage to the continental US to meet mission requirements of the Federal Railroad Administration, Federal Highways Administration, and other federal and state agencies in accordance with Public Law 105-66.

Uses for DGPS include:

?? Rescue operations,
?? Aids to navigation positioning,
?? Dredging operations,
?? Hydrographic surveys,
?? Positive Train control
?? Precision farming, and
?? Precision mining.

The Coast Guard DGPS also partners with other government agencies to improve weather forecasting, precision surveying, and geological monitoring.

DGPS is a land-based system which receives and processes GPS satellite position information from orbiting Global Positioning System (GPS) satellites, calculates corrections from a known position, and broadcasts these corrections via medium frequency (MF) transmitters to DGPS user receivers in the MF broadcast coverage area. DGPS user equipment automatically applies corrections to received GPS information to improve positional accuracy. DGPS is dependent on the overall operation of GPS, but can tolerate small-scale GPS satellite failures.

5.3.2.4.1 Equipment Information, Continued

5.3.2.4.1.2 Components

There are three main components of DGPS: the broadcast site, control station, and wide area data communications. N/DGPS broadcast sites are strategically positioned to cover the continental United States, Alaska, Hawaii, Puerto Rico. It is expected that nationwide expansion of the DGPS system will increase the number of broadcast sites to approximately 130 sites.

5.3.2.4.1.3 DGPS Control

DGPS is controlled from two locations: one in Alexandria VA (NAVCEN) and one in Petaluma CA (NAVCEN Detachment). A third Control Station is located at C2CEN and is used primarily for support and engineering, however could be used as a contingency.

5.3.2.4.1.4 Wide Area Communications

DGPS control stations monitor and control broadcast sites using a commercial wide area network provider. Each broadcast site has a dedicated 9.6kbps synchronous circuit installed which provides asynchronous connections to GPS receivers, MF transmitter, and remotes sensors. Each DGPS Control station uses two dedicated 56kbps data circuits.

5.3.2.4.2 Maintenance Levels for various DGPS sites

5.3.2.4.2.1 Maintenance levels for DGPS Broadcast Sites

Maintenance of DGPS electronic equipment is organized into four levels: (1) organizational, (2) intermediate, (3) depot, and (4) SMEF.

1) **Organizational –** DGPS sites are remotely located with no ETs assigned. MLCA/P and/or its subordinate units (ESU/ESD) or contractors are responsible for organizational level support. NAVCEN and NAVCEN Detachment are responsible for notifying the maintenance facility that a failure has occurred.
2) **Intermediate -** Maintenance at the DGPS sites consists of preventive and corrective maintenance and is performed by the applicable Maintenance and Logistics Command (MLC) and/or its subordinate units (ESU/ESD) or contractors.
3) **Depot -** Maintenance consists of the repair and stocking of modules, assemblies, and components used in the DGPS system. The CG Engineering Logistics Center Baltimore performs depot level maintenance.
4) **SMEF -** The Command and Control Engineering Center is the SMEF for DGPS Broadcast sites and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels.
5) **Facilities –** MLCA/MLCP is responsible for facilities maintenance at all N/DGPS sites.

5.3.2.4.2.2 Maintenance levels for DGPS Control System

1) **Organizational -** Maintenance consists of preventive and corrective maintenance and is performed by assigned personnel at NAVCEN or NAVCEN Detachment.
2) **Intermediate -**Maintenance consists of corrective maintenance beyond the capability of the assigned organizational level and is performed the Command and Control Engineering Center.
3) **Depot -** Maintenance consists of the repair and stocking of modules, assemblies, and components used in the DGPS system. Depot level maintenance is provided under commercial contract administered by the C2CEN.
4) **SMEF -** The Command and Control Engineering Center is the SMEF for the DGPS Control Station and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate level.

5.3.2.4.2 Maintenance Levels for various DGPS sites, Continued

5.3.2.4.2.3 Maintenance levels for Data Communication

1) **Organizational -** NAVCEN or NAVCEN Detachment is responsible for the organizational maintenance of the DGPS wide area communications system, which consists of notifying the intermediate maintenance facility that a failure has occurred.
2) **Intermediate -** Maintenance of the DGPS WAN consists of corrective maintenance beyond the capability of the assigned organizational level and is performed by applicable Maintenance and Logistics Command (MLC) and/or their subordinate units, or contractors.
3) **Depot -** Maintenance consists of the repair and stocking of modules, assemblies, and components used in the DGPS system. The CG Engineering Logistics Center Baltimore performs depot level maintenance.
4) **SMEF -** The Command and Control Engineering Center (C2CEN) is the SMEF for DGPS Broadcast sites and provides ‘last stop’ technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels.

5.3.3 Navigation Sensors and Systems

5.3.3.0.1 Scope

This section covers radar systems, IFF systems and its associated equipment, radio direction finder equipment, TACAN system, depth finders, and GPS receivers. The chapter is divided into sections covering each category of equipment with references and other pertinent information. Information regarding equipment requirements, capabilities and special procedures that are general in nature are also included. This chapter is not meant to replace any technical manual, but to furnish supplementary information. The C2Cen Navigation Sensor Branch is responsible for support and engineering for standard Coast Guard Radar and Navigation Sensor Systems. This includes Cutter primary RADAR System and secondary systems “Get Home RADAR”, Shallow Water Depth Sounder, VHF, MF/HF, UHF Direction Finders, and DGPS Receivers.. Additional information can be found at C2CEN intranet site. http://cgweb.lant.uscg.mil/c2cen.

5.3.3.0.2 Contents

This section contains the following topics:

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5.3.3.1 Global Positioning System (GPS)

5.3.3.1.1 Description

Global Positioning system will employ some twenty-six satellites in very high polar orbits. Their altitude will ensure a very large area of visibility from each satellite and extreme physical separation. The satellites continually transmit data on two frequencies. This data includes information such as satellite position and ranging information. The system is designed so that six to eleven satellites will be in view at any time and from any position. A fix can be obtained by using three satellites. The three intersection lines of position (LOP) define a point, giving the position in two dimensions latitude and longitude. The GPS fix can be improved by using four satellites. The four intersection LOP defines a point, giving the position in three dimensions, latitude, longitude and altitude.

5.3.3.1.2 Maintenance Procedures

Maintenance of the GPS and DGPS receivers is limited and divided into: organizational, and depot.

1) **Organizational** - Assigned maintenance personnel on the vessel or ESD personnel (for units without ETs), perform organizational level of preventive and correction maintenance. Actual repairs are limited to changing fuses, repairing external wiring, and replacing individual equipment in the system.
2) **Depot** - Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used in equipment system. The CG Engineering Logistics Center Baltimore performs all depot level maintenance and provides replacement equipment listed in ELC Support Gram.
3) **SMEF** - The Command and Control Engineering Center is the SMEF and provides ‘last stop’ technical assistance for corrective maintenance beyond the capabilities of the organizational. The SMEF responsibilities consist of resolution of System Trouble Reports (STR’s), System Improvement Reports (SIR’s), Engineering Change Proposals (ECP’s), development of field changes, and overall system engineering. For more information on the GPS/DGPS Systems, see the C2cen web page.

5.3.3.2 Shipboard Command and Control System (SCCS)

5.3.3.2.1 Purpose

The Shipboard Command and Control System (SCCS) is based upon the Global Command and Control System – Maritime (GCCS-M) architecture. GCCS-M is fully integrated and is utilized operationally by the various Services and Agencies of the Department of Defense.

5.3.3.2.2 Description

SCCS as the Command and Control System provides system operators and decision-making personnel a tactical display of the overall tactical situation by locating operator positions at key locations on the ship. These locations are the navigational bridge and the Combat Information Center (CIC). Though CIC is the primary system control point, all the system operator positions posses the ability to independently display tactical data of their choice which may be relevant to their particular task. The capability for the operators to display symbology and a live radar picture overlay of the current geographical area provides the Tactical Action Officer (TAO) with a complete tactical picture of the current operation.

5.3.3.2.3 Command Display and Control Integrated Navigation System

The Command Display and Control Integrated Navigation System, or COMDAC INS, is integrated into SCCS 270/210. It was designed to meet Coast Guard requirements and International, NATO and US Navy Standards. COMDAC INS includes dynamic tide and current vectors, continuously updated turn points, radar overlay for both navigation and collision avoidance, and the fusion of Command and Control and Navigation information. All members of the team in CIC and the bridge are able to work from and see the same picture. While available for use as a standalone system, ship's capabilities are multiplied when INS is with a DoD Command and Control system. These two capabilities exceed those of commercially available electronic navigation systems.

5.3.3.2.4 378' SCCS

The SCCS-378 functions are provided by three (3) TAC-3 computers, which are located in CIC. The computers are designated JOTS-1, JOTS-2, andfJOTS-3. Co-located with these computers are three (3) keyboard and trackball data entry positions, four (4) 19" color monitors, one per computer with the exception of JOTS-2 which has two (2), this allows for an additional operator position. Also, located within CIC are four (4) 25" color display monitors which can be controlled from JOTS-1 to display separate tactical pictures or data information screens as desired by the watch-standing team.

5.3.3.2 Shipboard Command and Control System (SCCS), Continued

5.3.3.2.5 270'SCCS

The SCCS-270 and COMDAC INS functions are provided by three (3) TAC-4 computers, which are located in CIC. The computers are designated Jots-1, JOTS-2, and JOTS-3. Co-located with these computers are three (3) keyboard and trackball data entry positions, which are the CIC Port Operator Position, CIC Starboard Operator Position, and the CIC Tactical Communications Officer (TCO) position. Five (5) 19" color monitors, two (2) per CIC Operator position with the exception of the TCO, which has only one display. This permits versatility in the display of information, as the operational situation requires. Also, located within CIC are one (1) 25" color display monitors which is controlled by JOTS-3 to display separate tactical pictures or data information screens as desired by the watch-standing team. There is an additional 19" color monitor, keyboard, and trackball which is utilized only for system admin functions.

5.3.3.2.6 210' SCCS

The SCCS 210 and COMDAC INS functions are provided by one (1) TAC-4 computer, which is located in CIC. The computer is designated as JOTS. Co-located with these computers is a keyboard and trackball, which is utilized for System Admin functions only. Located in CIC is the CIC Operator Position which consists of a 19" color monitor, keyboard and trackball. On the Bridge is the OOD operator position, which consists of the Flat Panel color display, keyboard and trackball. This permits versatility in the display of information, as the operational situation requires.

5.3.3.2.7 SCCS Sub-systems

SCCS utilizes various sub-systems such as, Global Positioning Satellite system (GPS), Long Range Radio Navigation System (Loran), ships gyrocompass, Doppler speed log, depth sounder, wind anemometers (270 only), Closed Circuit Television (CCTV), Optical Surveillance System (OSS) AN/SVD-1(B) (270 only), Surface Search radar (SPS-73), MK-XII AIMS Identification Friend/Foe (IFF) System with AN/UPX-59 Interrogator Set (270 & 378 only), MK-92 Fire Control System (GFCS) (270 & 378), and the Officer in Tactical Command Information Exchange System (OTCIXS), and the Tactical Data Link-11 (TADIL-A) with AN/USQ-125 Data Terminal Set (DTS) (378 only).

5.3.3.2.8 Maintenance Philosophy

All SCCS systems and subunits will be maintained under a three level concept.

1. **Organizational** - Maintenance will include preventative maintenance, troubleshooting and replacing system Lowest Repairable units (LRUs), and system operability verification.
2. **Intermediate** - ESD and ESUs will have limited knowledge on this system, and will provide limited technical assistance. Primarily they will coordinate supply logistics for deployed cutters.
3. **Depot/ICP** - The depot will perform depot level maintenance for all repair items listed in the APL.
4. **SMEF** - Responsibilities consist of resolution of System Trouble Reports (STR's), System Improvement Reports (SIR's), Engineering Change Proposals (ECPs), development of field changes, and overall system engineering. Technicians assigned to C2CEN perform maintenance for the installed SCCS Engineering and Technical Support Mock-up baseline systems. Additionally, C2CEN provides technical liaison to field units. The C2CEN SMEF Desk can be reached at (757)686-2156. Support calls and general SMEF Desk questions can be submitted via email at smefdeck@c2cen.uscg.mil. System documentation will be posted on C2CEN's intranet site at http://cgweb.lantuscg.mil/c2cen/.

5.3.3.3 Radar

5.3.3.3.1 Overview

This section covers radar systems installed on Coast Guard cutters, bats, and shore systems.

5.3.3.3.2 References

The following list of references should be used to expand and amplify on the material contained in this chapter:

a. EIMB, NAVSHIP 0967-000-0020 (RADAR)
b. EIMB, NAVSHIP 0967-000-0120 (ELECTRONIC CIRCUITS)
c. EIMB, NAVSHIP 0967-000-0130 (TEST METHODS AND PRACTICES)
d. EIMB, NAVSHIP 0967-000-0160 (GENERAL MAINTENANCE)

5.3.3.3.3 Description

Radar, as an electronic device for the detection and location of objects, must provide accurate target data (i.e., range and bearing). The radar must provide reliable information during those conditions when normal human vision fails, such as darkness, haze, fog, rain and snow. Three different radar systems will be described; shipboard, shore based, radar repeaters.

Basically radar displays, on a Plan Position Indicator (PPI), transmitted pulses that have been reflected from a target(s). The PPI sweep is synchronized to track with the antenna so that target information is displayed in the direction the antenna is pointing, or if a true bearing input is used, the target is displayed relative to true north.

5.3.3.3.4 Shipboard Radars

Shipboard radars operate in the VHF, L-Band, S-Band, and X-Band regions of the frequency spectrum, and provide surface and/or air search capabilities. Some radar installations have multiple indicators, allowing the presentation of target information at more than one place aboard the vessel. Gyro inputs are required to indicate true bearing information.

5.3.3.3.5 Shore-based Radars

Shore based X-Band radars are used for harbor surveillance in conjunction with the vessel Traffic Services (VTS). Very high resolution tower-mounted antennas and dual transmitter/receivers are often located at points remote from the Vessel Traffic Control (VTC) center in the area in which coverage is desired. Radar video, sync, and azimuth data are relayed by means of a simplex wideband link to the VTC. Radar site control and status signals are similarly relayed via duplex voice grade link. At the VTC center the relayed data is separated and distributed to controls and indicators at supervisor and operator positions.

5.3.3.3.6 Radar Repeaters

Radar repeaters include those PPI's that are usually nomenclatured as a "group" indicating that independent radar set must furnish trigger, video, and azimuth synchro signals before it can function. Only those units, assemblies and subassemblies included in specific nomenclature will be referred to under any one nomenclature.

5.3.3.3.7 Special Procedures and Maintenance

Ship's personnel except under very unusual and urgent circumstances should not normally attempt removal of large, heavy radar antennas from a vessel. Removal of antenna should be handled only while a vessel is moored. To prevent serious accidents when removing radar antennas, every safety precaution shall be taken. All wave-guides and cables shall be disconnected prior to antenna removal. The open ends of any wave-guide shall be covered with plastic or similar material to prevent the entrance of contaminants. After the antenna is removed, it should be placed either on a vehicle to be moved to its planned destination, or placed on suitable clean material, such as a canvas, to prevent structural damage and internal contamination.

5.3.3.3.8 Radome Special Procedures and Maintenance

Radomes are fabricated of electrically nonconductive material, such as fiberglass laminate. This laminate and other plastic materials require no paint for preservation. When it is necessary to make the radome color match the vessel's color, the following precautions must be observed; a nonconductive, nonmetallic paint shall be used, and only the thinnest coat to give the desired color shall be applied. Application of paint to the Radome will change the dielectric properties in proportion to the thickness of the paint film. To avoid building up film thickness, do not apply with a brush; use a thin spray coating. The words "DO NOT PAINT" shall be stenciled in contrasting color along the lower side of the Radome to prevent ship's force from inadvertently painting the Radome while engaged in painting other structures.

5.3.3.3.9 Squint angle

On the top of most radar antenna arrays there is a line scribed (etched) into the metal enclosure. This line is provided for "squint angle" considerations when aligning the radar servo system, and is the actual angle at which the main power lobe of the antenna is found. Care should be taken, when painting the antenna, not to completely eradicate this line.

5.3.3.4 Identification Friend or Foe (IFF) Equipment

5.3.3.4.1 References

The following list of references should be used to expand and amplify on the material contained in this chapter:

a. EIMB, NAVSHIP 0967-000-0020 (RADAR)
b. EIMB, NAVSHIP 0967-000-0120 (ELECTRONIC CIRCUITS)
c. EIMB, NAVSHIP 0967-000-0130 (TEST METHODS AND PRACTICES)
d. EIMB, NAVSHIP 0967-000-0160 (GENERAL MAINTENANCE)
e. Electronics Installation and Maintenance Book RADAR and ELECTRONICCIRCUITS
f. NAVEDTRA 10197 Electronics Technician 3 & 2
g. Navy Electricity an d Electronics Training Serier (NEETS) modules 18, RADAR PRINCIPLES
h. NAVEDTRA 10197 Electronics Technician 3 & 2 Navy Electricity and Electronics Training Series (NEETS) modules 18, RADAR PRINCIPLES

5.3.3.4.2 Description

Air Traffic Control Radar Beacon (AIMS) IFF equipment is used with search radar to permit a friendly craft to automatically identify itself before approaching near enough to threaten the security of other friendly craft. In addition IFF can be used to provide other information, such as type of craft, squadron, side number, mission, and aircraft altitude. The basic steps of this identification are:

?? CHALLENGE,
?? REPLY, and
?? RECOGNITION.

5.3.3.4.3 Challenge Modes

To perform the identification process, two sets of IFF equipment are used. These are the interrogator (challenge and recognition) and transponder (reply) sets.

Mode 1 - Utilization as directed by field command, 32 response codes are available.

b. Mode 2 - Platform Identity- Identifies a specific airframe or ship, 4096 response codes are available.
c. Mode 3/A - Identity codes for Air Traffic Control, 4096 response codes are available.
d. Mode 4 - secure identification of friendly platform.
e. Mode C - Barometric pressure altitude of aircraft in 100 foot increments (range for altitude measurement is from 1000 ft to 126,500 ft mean sea level).

5.3.3.4.4 Operational Uses

1. Anti-Air Warfare- Uses Modes 1, 2, 3/A, 4 to provide complete identification of airborne platforms.
2. Air Control- Uses Modes 2, 3/A, C to provide necessary data for control of friendly aircraft.
3. Surface Identification- Uses Modes 1, 2, 3/A, 4 for complete identification of friendly surface platforms.

The transponder provides the shipboard interrogator operator with special warnings, both audible and visual, upon receipt of any of the three special purpose replies.

CODE	**MEANING**
7700	Emergency
7600	Communications Failure

Other codes: As assigned by air traffic control or controlling ground/ship station.

5.3.3.4 Identification Friend or Foe (IFF) Equipment, Continued

5.3.3.4.5 AN/UPX-25(v) (Series) IFF Interrogator Set

The AN/UPX-25(v) Interrogator Set is installed on those platforms with Air Search Radar capabilities. The interrogator System, synchronized with its associated Air search Radar Set, provides complete identification of all transponder equipped targets observed, and is accomplished by interrogating the target transponders (with RF coded pulse groups) and decoding the corresponding transponder replies.

5.3.3.4.5.1 Performance Characteristics

Performance Characteristics	
Transmit Frequency	1030 MHz
Peak Power	Continuously variable
Receive Frequency	1090 MHz
Type of Modulation	Coded Pulse Groups
Sensitivity	Normal –84dBm
Range	Line of Sight
Antenna Type	Rotating linear array

Table 5.3.3-1 AN/UPX-25(v) Performance Characteristics

5.3.3.4.6 AN/UPX-28(v) (Series) IFF Transponder Set

The AN/UPX-28(v) Transponder system is used on most surface vessels. The transponder provides RF coded pulse groups in response to corresponding interrogations.

5.3.3.4.6.1 Performance Characteristics

Performance Characteristics	
Transmit Frequency	1090 MHz
Peak Power	500 Watts
Receive Frequency	1030 MHz
Type of Modulation	Coded Pulse Groups
Sensitivity	Normal –77dBm
Range	Line of Sight
Antenna Type	Omni-Directional

Table 5.3.3-2 AN/UPX-28(v) performance Characteristics

5.3.3.4.7 AN/APX-72, AN/APX-100, and 621 A-3

AN/APX-72, AN/APX-100, and 621A-3 are used as aviation IFF equipment.

5.3.3.4.8 Maintenance Philosophy for IFF

1) **Organizational -** Within the capabilities of the unit, organizational level maintenance will consist of fault isolation, mainframe component replacement, and module replacement, as well as periodic preventive maintenance such as cleaning, lubrication, and adjustments required by CGPMS and Navy preventive maintenance schedules.
2) **Intermediate -** A function of the supporting Electronics System Support Unit (ESU), or MLC coordinated contractor. This level of maintenance parallels that of the organizational level.
3) **Depot -** Consists of the repair of non-aviation depot level repairable modules by the U.S. Navy.

5.3.3.5 Tactical Air Navigation (TACAN)

5.3.3.5.1 Description

From the Aircraft Flight Manual:

"The TACAN system is a short-range, omni-bearing, distance-measuring navigation system. This system provides a continuous indication of the bearing and distance of the airplane from either a selected TACAN surface beacon located within a line-of-sight distance up to 390 nautical miles or a TACAN beacon from suitably equipped, cooperating aircraft located within a line-of-sight distance up to 200 nautical miles. Since the TACAN system operating limit is line-of-sight, the actual operating range is dependent on the airplane's altitude and terrain. The airborne TACAN radio set and the surface beacon operate on interrogator-responsor-transponder principles. Distance (range) information is determined by measuring the elapsed time between transmission of an interrogation pulse from the airborne radio set and the reception of a reply pulse from the surface beacon. Bearing information is determined by the measurement the phase difference between a reference bearing signal and a variable signal, both transmitted by the surface beacon.

The system operates on a selected channel from the 252 TACAN channels available. The 252 channels are equally divided into 126 X channels and 126 Y channels with both X and Y channels spaced 1 MHz apart. The transmitter section transmits interrogation pulses in the frequency range of 1,025 to 1,150 MHz; and the receiver section operates in the frequency range of 962 to 1213 MHz. The receiver section receives surface beacon pulses, prepares the received information for display on the bearing and distance indicators, and provides a signal to the flight director computers for control of the command bars on the ADI during operation in the TACAN mode. Aural signals identifying the selected surface beacon are transmitted through the intercommunications system to the flight crew."

5.3.3.5.2 References

The following list of references should be used to expand and amplify on the material contained in this chapter:

a. NAVEDTRA 10195-A
b. Equipment Technical Manual

5.3.3.5 Tactical Air Navigation (TACAN), Continued

5.3.3.5.3 Maintenance Philosophy

1) **Organizational -** Within the capabilities of the unit, organizational level maintenance will consist of fault isolation, mainframe component replacement, and module replacement, as well as periodic preventive maintenance such as cleaning, lubrication, and adjustments required by CGPMS and Navy preventive maintenance schedules.
2) **Intermediate -** Intermediate level maintenance consists of corrective maintenance beyond the capability of the assigned organizational level is performed by the applicable Maintenance and Logistics Command (MLC) and/or their subordinate units or contractors.
3) **Depot -** Depot level consists of the repair of non-aviation depot level repairable modules by the U.S. Navy.

5.3.3.6 Depth Finders

5.3.3.6.1 Description

Depth Finders are installed on Coast Guard cutters and boats for navigating in both shallow and deep water. The Depth Finder information has been integrated with vessels plotting systems and other Command and Control Systems to aid the crew in the navigation of the vessels.

5.3.3.6.2 References

The following list of references should be used to expand and amplify on the material contained in this chapter

a. Equipment Technical Manuals
b. NAVSEA 0967-LP-000-0040 Electronics Installation and Maintenance Book TEST EQUIPMENT
c. NAVSEA 0967-LP-000-0130 Electronics Installation and Maintenance Book TEST METHODS & PRACTICES.

5.3.3.6.3 Maintenance Philosophy

Maintenance of the Depth Finder is organized into four levels: (1) organizational, (2) intermediate, (3) SMEF, and (4) depot.

1) **Organizational -** Organizational level of preventive and correction maintenance and is performed by assigned personnel on the vessel.
2) **Intermediate -** Intermediate level maintenance consists of corrective maintenance beyond the capability of the assigned organizational level is performed by the applicable Maintenance and Logistics Command (MLC) and/or their subordinate units or contractors.
3) **Depot -** Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used in the OSS. The CG Engineering Logistics Center Baltimore performs most depot level maintenance.

Continued on next page

5.3.3.6.3 Maintenance Philosophy, Continued

4) **SMEF -** The Command and Control Engineering Center is the SMEF and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels. The SMEF responsibilities consist of resolution of System Trouble Reports (STR's), System Improvement Reports (SIR's), Engineering Change Proposals (ECP's), development of field changes, and overall system engineering. For more information on the Depth Finders, see the C2cen and manufacture web pages.

5.3.3.7 Radio Direction Finders

5.3.3.7.1 Overview

This section provides a general description of the radio direction finder equipment operated and maintained aboard Coast Guard floating units, it also discusses homers and ADFs. This section also contains information concerning specifications and parts makeup of radio direction finders in use in the Coast Guard and then explains calibration procedures and performance tests.

5.3.3.7.2 References

In addition to the technical manuals, the following publications, held by the unit or available for reference through the chain of command, provide information concerning radio direction finders which may prove useful:

a. NAVSHIP 0967-000-00 10, Electronics Installation and Maintenance, Communications.
b. Light List, Vol. I - Atlantic Coast (St. Croix River, Maine to Shrewsbury River, New Jersey), COMDTM 165021
c. Light List, Vol. II - Atlantic and Gulf Coasts, COMDTM 165023
d. Light List, Vol. III - Pacific Coast and Pacific Islands, COMDTM 165021
e. Light List, Vol. V - Mississippi River System, COMDTM 165025
f. Light List, Vol. VI – Pacific Coast and Pacific Islands, COMDTM 165026
g. Light List, Vol. VII- Great Lakes, United States and Canada, COMDTM 165027

(The Light Lists can be ordered at the Defense Supply Center website, http://daynt6.daas.dla.mil/webreq/.)

5.3.3.7.3 Description

It is not the intent of this chapter to give full treatment of the theory of operation of direction finders. The service manual or instruction booklet for the specific equipment usually presents the theory of operation in sufficient detail. Radio direction finding equipment in the Coast Guard is used for locating persons in distress as well as for navigation. Depending upon the type of platform, e.g., cutter, aircraft, boat or shore and the mission of the unit, direction finding may consist of homing on a transmitted signal or taking a bearing around the full 360-degree azimuth. Most of the equipment in the Coast Guard shipboard inventory is able to take bearings throughout the 360-degree azimuth. Equipment known as a homer can only solve the 180-degree ambiguity by maneuvering the platform. Basically these units consist of an antenna system, a receiver, and an indicator packaged separately or with the receiver.

5.3.3.7.4 Antennas

Various direction-finding antennas exist from single rotatable loops to electronically scanned arrays; crossed 20 loop ferrite assemblies make Small antennas possible. Typical antenna designs are based on the frequency range desired. The number of antenna elements varies from four to as many as sixteen, depending on the application. Antennas contain active circuitry enabling longer RF cable runs and eliminating the transmission of phase sensitive information over long distances. High mounting points for VHF and UHF antennas are crucial due to bearing inaccuracies brought about by re- radiation of signals from other structures on ship or shore. It is recommended that antennas are mounted at the highest point possible. Increasing the aperture and the number of antenna elements may reduce susceptibility to re-radiation at VHF and UHF frequencies. Cost limits the amount of elements used on Coast Guard units. The Coast Guard generally uses the following configurations, however the list is not all-inclusive: VHF - 4-element doublet antenna; UHF - Crossed dipoles; and MF/HF - Crossed loop type antennas. Mounting location is of paramount importance to the performance of VHF-FM/AM ADF due to the limited number of elements in the antenna.

5.3.3.7.5 Direction Finder Performance

A number of factors can affect the performance of a direction finder, depending upon the frequency used and/or the antenna site. At MF/HF frequencies performance can be affected by interfering sky waves, especially during evening hours and at times in day light hours. Nearby structures, which re-radiate signals and produce phase differences in the received signal will introduce errors in bearing. In some cases the DF will indicate a bearing on this re- radiation or give the vector sum of that bearing and the bearing of the actual emitter. This effect will be most severe when the re-radiating element of the vessel or shore installation structure is near a quarter wavelength of the received signal. Thus masts, or other antennas may produce enough reradiation to make taking a DF bearing impossible. Taking bearings over land may also lend itself to producing errors due to the combination of much higher ground wave attenuation, site errors, sky wave interference, and atmospheric and polarization errors. Consequently accuracy is usually not better than 15 degrees, and the useful range not much above 200 miles at 200 KHz and 50 miles at 2 MHz. Heavy atmospherics can reduce the useful range even further.

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5.3.3.7.5 Direction Finder Performance, Continued

At VHF frequencies, performance is principally affected by re-radiating signals from nearby objects and line-of-sight considerations, thus the highest and least obstructed antenna mounting site is of the utmost importance to performance. Vertical and horizontal separation of the antenna from other structures and antennas will substantially reduce the bearing error. Because of this, the use of the VHF-ADF for navigation purposes is not recommended.

5.3.3.7.6 Equipment Operation

Radio direction finders installed on Coast Guard vessels vary from MF/HF, VHF, and UHF Automatic Direction Finders. An installation normally consists of a loop or crossed loops and sense antenna, or a vertical array of two or four monopoles, an antenna -to-receiver coupling unit, a receiver and an indicator giving relative bearing or as in the case of a two element vertical array antenna (Homer), a direction to turn to. The following list covers frequency capabilities and features of ADFs used in the Coast Guard today. With ever-changing technology it would not be productive to list particular models due to rather short life spans of equipment used today.

a. MF/HF Direction Finders:

Frequency coverage from 200kHz to 30.000MHz in 100 Hz steps
Crossed Loop antenna
Built into base antenna PCB
Synthesizer double conversion super-heterodyne
Automatic and manual tuning
Scanning channel reception of stored channels
Scanning frequency reception from preset ranges

Continued on next page

5.3.3.7.6 Equipment Operation, Continued

b. VHF Direction Finders:
   Frequency coverage fkom 1 10.000 - 179.999 MHz, in 1 kHz steps
   Four element doublet antenna
   Built-in base antenna switching PCB
   Synthesizer double conversion super-heterodyne receiver
   International VHF *55* channels
   US weather channels (4)
   Aircraft distress channels and Class I11 EPIRB of 121.500 MHz

c. UHF Direction Finders:
   Frequency coverage from 220 MHz to 4 10 MHz, in 1 kHz steps
   Crossed dipole antenna
   Built into base antenna PCB
   Synthesizer double conversion super-heterodyne
   Automatic and sequential frequency scanning

5.3.3.7.7 Maintenance Philosophy

Generally the maintenance and repair of today’s direction finders will be accomplished at the unit level. Consult individual equipment technical manuals and available CGPMS for maintenance and alignment procedures. Typical test equipment required for DF testing and Planned Maintenance is as follows:

General Purpose Electronic Test Equipment (GPETE):

a. VHF FM Signal Generator (SCAT 4370) or (SCAT 4345)
b. Digital Multi-meter, 4.5 digits (SCAT 4212)
c. dB Scale Multi-meter (SCAT 4245)
d. Simpson 260 Multi-meter (SCAT 4245)

Depot - Support will be provided by ELC Baltimore. ESUs and ESDs provide intermediate support for Direction finders. C2CEN is the SMEF for direction finders. Additional information concerning specific Direction finder scan be found under NavSensors and EILSP on the C2CEN Intranet site at **http://cgweb.lant.uscg.mil/c2cen.**

5.3.3.7.8 Calibration

Calibrations of all direction finder are performed to accurately record the deviation of the radio direction finder bearing indication from the actual bearing at all points of azimuth. This is accomplished by taking simultaneous visual and radio direction finder bearings on a target transmitter at small intervals of azimuth and then computing the error, called deviation, for each direction finder bearing. The deviation is then plotted on form CG-2588, Radio Direction Finder Calibration Chart., for MF/NAV DF's, and a smooth curve drawn through the points. The purpose of this section is to discuss the techniques necessary to insure that the calibration results in a usable curve and to specify calibration requirements and intervals.

5.3.3.7.8.1 Calibration Requirements

Every radio direction finder shall be calibrated:

a. When initially installed.
b. After any modification to antenna configurations or other topside structures such as guns, turrets, boat davits, etc.
c. After any modifications are performed on the DF equipment in the antenna configuration, cable runs, goniometer, or RF section. When work is done on the indicator or receiver, other than the RF section, usually only the azimuth scale alignment needs to be checked.

5.3.3.7.8.2 Re-Calibration Requirements

Every radio direction finder, with the exception of homers, shall be recalibrated:

a. When the deviation obtained from a spot accuracy check disagrees by more Calibration than 3 degrees (either positive or negative) from the Posted Calibration Requirements Chart.
b. When spot accuracy checks over a short period of operation and on significantly different relative bearings indicate a significant change in the plotted smooth curve. A complete reversal of the sense of the deviations (more than three points observed) over 360 degrees is considered significant, although the magnitude of the deviations may still be small.
c. Within twelve (12) months of the date of the posted curve.

5.3.3.7.8.3 Accuracy Checks

All cutters and boats shall check the accuracy of their direction finders, including homers, whenever possible and, at least, every six months. The six-month accuracy checks shall be noted on CG-2588.

5.3.3.7.8.4 Submission Requirements

The original of the current calibration chart shall be posted in a conspicuous location, near the direction finder so that the operator may easily use it. Send one copy of the completed form CG-2588 to the MLC Commander. The MLC Commander will check calibration charts during routine inspections. It is not required that CG-2588's be sent to Commandant (G-SCE).

5.3.3.7.8.5 Preparation for Calibration

Before attempting calibration of any DF the following advance preparations are necessary:

a. Ensure that the direction finder is in proper operating condition.
b. Coordinate plans with the commanding officer and operations officer of the vessel. Prior planning is necessary to allow enough time for ship movements.
c. Make arrangements with a second vessel (small boat) for calibration in the case of VHF-FM/AM ADF.
d. Check all bonds and grounding of the rigging.

5.3.3.7.8.6 Calibration Team

The number of people directly involved in the calibration procedure will vary according to the size of the vessel. A recommended team to perform the calibration effectively, with their duties, is a follows:

a. The calibration officer stations himself in a position where he can coordinate and, if possible observe the activities of the helmsman, pelorus operator, direction finder operator, and recorder. He should also be in contact with the second vessel assisting in the case of VHF-FM/AM ADF calibration.

Continued on next page

5.3.3.7.8.6 Calibration Team, Continued

b. The recorder keeps a record of the simultaneous pelorus and DF bearings as described below. He should be in a location to hear the "ark" of the pelorus operator and the bearings called out by the DF operator. This may require the use of sound-powered phones.
c. The direction finder operator should be skilled in the use of the equipment to be calibrated and be familiar with the calibration procedures. As the second vessel is maneuvered around the ship, or as the vessel swings relative to the calibration beacon, the pelorus operator calls out the "mark" passing each five degrees of azimuth. The direction finder operator passes the bearing to the recorder at each "mark".
d. The pelorus operator should be well qualified in this capacity as the effectiveness of the calibration depends on his accuracy. On larger vessels one pelorus operator on each bridge wing will be necessary to maintain the smooth, continuous swinging of the ship relative to the calibration beacon or to maintain constant bearings to the second vessel. In the case of the VHF-ADF, at each five degree increment, the pelorus operator will "mark" the direction of the second vessel.
e. The VHF operator on the second vessel must be familiar with the calibration procedure and ensure that he is transmitting when needed.
f. The helmsman and Officer of the Deck (OOD) of the vessel being calibrated, or the coxswain of the second vessel, should be well qualified and alert to insure proper headings and turns as their vessel swings around the vessel performing the calibration.
g. A plotter, if used, should maintain a continuous plot of the deviation so the calibration officer can keep a running check on the progress of the calibration.
h. The OOD must be fully briefed as to the intent and step-by-step procedures so that he will be able to manage the ship in the most efficient manner. In the case of the MF/NAV calibration he should be able to control the vessel in a continuous, smooth swing and be proficient in making the predetermined runs and turns necessary for the calibration.

5.3.3.7.8.7 Calibration Procedures (Step-by-Step)

All calibrations should be made with the vessel's gear in normal position. Ventilators, guns, booms, antennas, rigging, davits, stays, and metallic lines should be in the position assumed for normal cruising. The calibration officer and the communication officer should decide beforehand on a "standard" antenna and equipment configuration. In most cases the antennas will open (disconnected from the transmitter and from ground) or tuned (connected to a receiver or transmitter which is tuned to a specific frequency). This configuration must be noted on the calibration form.

a. Check Pelorus. Just prior to getting underway, check the pelorus one ach wing of the bridge to verify that they are both zeroed with the ship's lubber line. Relative, not true, bearings are required. Calibration should be attempted only in calm seas and with good visibility to ensure that the pelorus operator can maintain visual bearing on the target transmitter.
b. Calibration Procedures:
   1) MF: Own ship swings 360 degrees very slowly while observing the target (transmitting source). At the instant the DF operator obtains a bearing (at five degree intervals, 000,005,010, ..., 355,000) they will call out "mark" and the pelorus operator will call out the bearing to the target. Upon completion of this procedure, the data will be recorded, bearing error calculated, and the data will be plotted on form CG-2588 (or similar). Post the form near the ADF.
   2) HF: Due to re-radiation and the erratic deviations it causes, calibration shall consist of a homing evaluation. Homing operations shall be checked on at least two frequencies, one close to 21 82 kHz and the other as appropriate for local operations. The homing evaluation is considered successful if the dead ahead bearing error is less than 10 degrees. While attempts may be made to calibrate HF frequencies through 360 degrees, it is important to follow the procedures as outlined for MF frequencies. If the VHF calibration procedures are used at HF frequencies, large bearing errors will occur at the beam of the vessel. These results will give the appearance of unsatisfactory performance of the ADF equipment..

Continued on next page

5.3.3.7.8.7 Calibration Procedures (Step-by-Step), Continued

3) VHF: A small boat with handheld VHF transmitter circles own ship at a distance of 1 to 2 miles. At the instant the pelorus operator obtains a bearing (at five degree intervals, 000,005,010, ..., 355,000) to the small boat, they will call out “mark” and the direction finder operator will call out the ADF bearing. Upon completion of this procedure, the data will be recorded, bearing error calculated, and data will be plotted on form CG-5667 (or similar). Post the form near the ADF. While this procedure is recommended for units that do not have access to a SESEF facility, it is acceptable for a vessel to utilize the SESEF service for this procedure. VHF DF procedure differs from the MF/HF procedure in that the pelorus operator is calling the “mark”. This allows own ship to turn at a faster rate, thus being able to complete the procedure quicker.
4) UHF: It is recommended to use the VHF calibration procedure for UHF calibration. Frequencies close to 243 MHz and 403 MHz are recommended test frequencies.

5.3.3.7.8.9 Calibration Plotting Curve

When plotting the calibration curve, it is important to note that the ADF bearing is plotted on the horizontal axis, and the bearing error on the vertical axis. Past units have mistakenly plotted the relative (pelorus) bearing on the horizontal axis. Relative bearing of target from own ship is the info that is derived from The calibration curve. When an incoming DF signal is received, DF bearing indication is used to find bearing error. Bearing error is then added to or subtracted from the DF bearing indication to calculate target relative bearing.”

5.3.3.8 WLM/WLB Integrated Ship Control System (ISCS)

5.3.3.8.1 Overview

This section contains administrative and technical information for the Integrated Ship Control Systems (ISCS) installed on 175' Coastal Keeper Class Buoy Tenders (WLM), 225' Juniper Class Buoy Tenders (WLB), and other Coast Guard vessels. It contains general information regarding equipment requirements and system capabilities. Specific information is provided via references or hyperlink. This chapter does not replace any technical manual. The C2CEN Intranet site at http://cgweb.c2cen.uscg.mil may be used to expand the information covered in this section.

5.3.3.8.2 Description

The Integrated Ship Control System (ISCS) provides positive ships control with precise navigation and station keeping by automating methods of command, control, and monitoring of steering, navigation, propulsion, electric, hydraulic and auxiliary systems. The 225' Juniper Class (WLB) and 175' Keeper Class (WLM) buoy tenders are equipped with the Dynamic Positioning Systems (DPS), the Machinery Plant Control and Monitoring System (MPCMS), the Electronic Chart Precise Integrated Navigation System (EPCINS), and the Survivable Adaptable Fiber Embedded Network Local Area Network (SAFENET LAN). These technologies enable all crews to operate and maintain the ships propulsion and engine systems in an extremely safe manner.

5.3.3.8.3 Components

The ISCS consists of the following components:

a. Dynamic Positioning System (DPS): This system enables the vessel to maintain position and heading automatically (hover over ground) and to maintain speed and direction or follow and maintain track. Additionally, it measures deviations from set heading and reference position and compensates by use of vectors and turning movements produced by thruster propulsion.

b. Machinery Plant Control and Monitoring System (MPCMS): The purpose of this system is to provide remote control, monitoring and alarm annunciation of the ship's propulsion and machinery systems.

Continued on next page

5.3.3.8.3 Components, Continued

c. Survivable Adaptable Fiber Optic Embedded Network (SAFENET) Local Area Network (LAN): This provides a distributed digital communications capability that enables data exchange among the connected systems. The SAFENET LAN systems supports integration of ship control systems including the onboard navigational systems sensors, positioning systems, machinery control and electronic display systems. Figure 5.3.3-1 (below) displays the relationship of the SAFENET LAN to the rest of the ISCS equipment.

d. Electronic Chart Precise Integrated Navigation System (ECPINS): ECPINS is a computerized navigational aid that displays an electronic chart and data from navigation sensors. ECPINS receives navigation data via the vessel's fiber-optic network, SAFENET LAN. It also displays machinery plant information from the MPCMS via the SAFENET LAN and buoy data that is derived from a buoy data base.

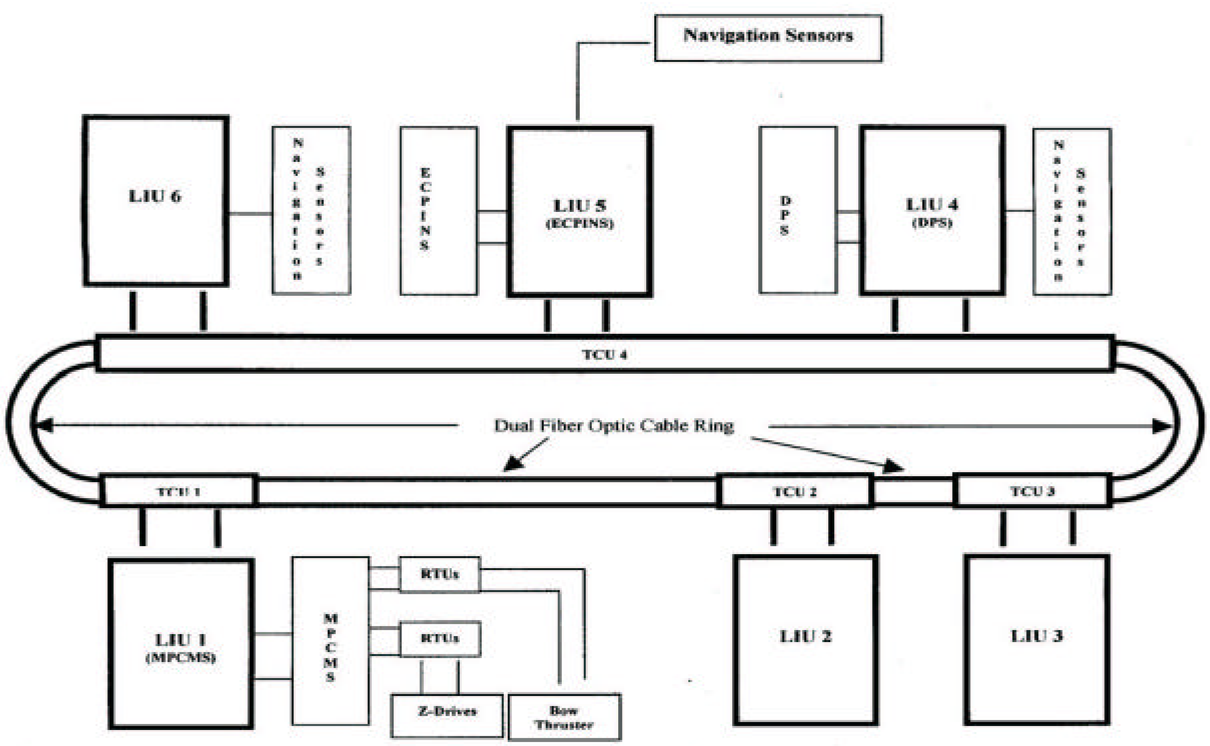

Figure 5.3.3-1 Relationship between SAFENET LAN and the ISCS equipment

5.3.3.8.4 Maintenance Philosophy

Maintenance and support of the WLM/WLB ISCS electronic equipment is organized into four levels: Organizational, Intermediate, Depot and SMEF.

1. **Organizational** - Organizational level of preventive and correction maintenance is performed by assigned personnel on the vessel.
2. **Intermediate** - Intermediate level maintenance consists of corrective maintenance beyond the capability of the assigned organizational level is performed by the applicable Maintenance and Logistics Command (MLC) and/or their subordinate units.
3. **Depot -** Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used in the WLM/WLB ISCS system. The ELC Baltimore performs all depot level maintenance.
4. **SMEF -** The Command and Control Engineering Center (C2CEN) and the ELC have split the SMEF responsibilities for WLM/WLB Integrated Ship Control System. C2CEN is SMEF for the ECPINS and SAFENET LAN and the ELC is SMEF for the DPS and MPCMS. The SMEF provides 'last stop' technical and engineering assistance for maintenance beyond the capabilities of the organizational and intermediate levels. For more information on the WLM/WLB ISCS see the C2CEN intranet site at http://cgweb.uscg.mil/c2cen/.

5.3.4 Optical Systems

5.3.4.0.1 Overview

This section contains administrative and technical information for standard video recording and display systems used on Coast Guard vessels and shore units. This chapter is organized into sections describing the Optical Surveillance System (OSS) used in the SCCS-270' system and the Flight Deck Closed Circuit used on platforms with flight deck capabilities. It contains general information regarding equipment requirements and system capabilities. Specific information is provided via references or hyperlink. This section does not replace any technical manual.

5.3.4.0.2 References

The following list of references may be used to expand the information covered in this chapter:

a. EILSP's
b. Technical Manuals
c. C2CEN website http://c2cen.uscg.mil, (internet) http://cgweb.c2cen.uscg.mil (intranet) (check URL's)

5.3.4.0.3 Contents

This section contains the following topics:

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5.3.4.1 Optical Surveillance Systems

5.3.4.1.1 System Description

The AN/SVD-1 Optical Surveillance System (OSS) is designed to mount on the USCG 270’ Medium Endurance Cutters. The system consists of a Low Light Level TV (LLLTV) and a Infrared/High Intensity searchlight mounted on a two-axis stabilized Positioner. The OSS is used for surveillance operations, visual navigation and as a fire control check sight. The Camera, Searchlight and Positioner are remotely operated from the pilothouse. The system is integrated with the MK92 Fire Control System and the SCCS-270 system. Video is supplied to the SCCS for display and recording purposes.

5.3.4.1.2
OA – 9296/ SVD – 1B Positioner Group

The system consists of three groups:

1. The OSS Positioner allows both elevation (+25? to –20?) and azimuth (+/-150?) positioning and is equipped with installed gyros to allow camera/searchlight stabilization under conditions normally experienced at sea. It is equipped with dual axis electrical/mechanical stow locks and can be stowed under non-operating conditions.
2. The LLTV is a B.E. Meyers "Dark Invader" 5003 monochrome CCD video camera designed for both high and low light level environments. The Camera is coupled to a Zoomar Lens Assembly. It has a focal range of 1500ft to infinity and it also has remote focus, zoom, iris and reticle intensity functions.
3. The Searchlight is capable to producing over 50-million candlepower Infrared (IR)/White Light and can be varied in beam width (1 to 7deg beam spread). The Searchlight can either be remotely controlled via Port Side Bridge Console or by the local (casualty) mode using the Searchlight Control Unit, located in the pilothouse overhead.

5.3.4.1.3 Maintenance

Maintenance of the Optical Surveillance System (OSS) is organized into four levels:

1. **Organizational** - Organizational level of preventive and correction maintenance is performed by assigned personnel on the vessel.
2. **Intermediate**- Intermediate level maintenance consists of corrective maintenance beyond the capability of the assigned organizational level is performed by the applicable Maintenance and Logistics Command (MLC) and/or their subordinate units or contractors.
3. **SMEF** - SMEF responsibilities consist of resolution of System Trouble Reports (STR's), System Improvement Reports (SIR's), Engineering Change Proposals (ECP's), development of field changes, and overall system engineering. The Command and Control Engineering Center (C2CEN) performs SMEF maintenance for the Flight Deck Closed Circuit Television system.
4. **Depot**- Depot level maintenance consists of the repair and stocking of modules, assemblies, and components used in the OSS. The CG Engineering Logistics Center Baltimore performs all depot level maintenance.
5. The Command and Control Engineering Center is the SMEF and provides 'last stop' technical assistance for corrective maintenance beyond the capabilities of the organizational and intermediate levels. The SMEF responsibilities consist of resolution of System Trouble Reports (STR's), System Improvement Requests (SIR's), Engineering Change Proposals (ECP's), development of field changes, and overall system engineering. For more information on the OSS, see the C2CEN Intranet site at: http://cgweb.uscg.mil/c2cen/.

5.3.4.2 Flight Deck Closed Circuit Television (CCTV) Systems

5.3.4.2 References

a. Equipment/System Integrated Logistics Support Plan (EILSP); Flight Deck Pan/Tilt Equipment - 0CUW5-AD-1240-24 Outdoor Unit, 0CUW5-AD-1200A Controller http://cgweb.comdt.uscg.mil/g%2Dsce/sce%2D1/aci/pantilt.html
b. Equipment/System Integrated Logistics Support Plan (EILSP); Flight Deck Low Light Level Closed Circuit Television Cameras, GCF-C2-CCTV-LLL-16 (wide angle), GCF-C2-CCTV-LLL-22(zoom) http://cgweb.comdt.uscg.mil/g%2Dsce/sce%2D1/aci/cctv.html
c. Depot Level Electronics Technical Manual for GCF-C2-CCTV-LLL-16 & 22
d. Allowance parts list (APL) for GCF-C2-CCTV-LLL-22: EAM 2BHM
e. Allowance parts list (APL) for GCF-C2-CCTV-LLL-16: EAM 2BHN
f. Fleet Drawing FL-6701-216
g. Allowance Parts List (APL for 0CUW5-AD-1240-24 Outdoor Unit: EAM Code 2BHP
h. Allowance Parts List (APL) for 0CUW5-AD-1200A Controller: EAM Code 2BHQ
i. AD1240 Pan/Tilt Installation & Operation Technical Manual
j. AD1200A Pan/Tilt Controller Installation & Operation Technical Manual
k. 378-FRAM-E-439-007 Rev G – CCTV TM and TC Block & ISO Wiring Diagram
l. 378-FRAM-W-439-001 Rev E – CCTV TM and TC Block & ISO Wiring Diagram
m. 901WMEC –439-001 Ref J – CCTV TM and TC Block & ISO Wiring Diagram
n. 905WMEC-439-001 Rev F – CCTV TM and TC Block & ISO Wiring Diagram
o. 618WMEC-439-002 Rev B – CCTV TM and TC Block & ISO Wiring Diagram
p. 627WMEC-439-001 Rev C – CCTV TM and TC Block & ISO Wiring Diagram
q. 482WMEC-439-001 Rev A – CCTV TM and TC Block & ISO Wiring Diagram

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5.3.4.2.2 System Description

Closed Circuit Television systems (CCTV) consist of low light level television cameras and pan/tilt equipment. The cameras provide the USCG ships with a day/night extremely low light level imaging capability. All flight deck capable vessels are required to have a means of viewing the flight deck and LSO during normal low light level conditions through a zoom camera system on a pan/tilt.

5.3.4.2.3 Maintenance Levels

Both the cameras and pan/tilt assemblies will be maintained under a two level concept. Organizational and Depot/ICP. At the Organizational level the system will be maintained through cleaning, storage and shipping. The Depot level will perform all repairs of failed systems.

1. **Organizational:** Organizational maintenance will include system removal and replacement, re-test verification, cleaning and inspection, connector preservation and shipping.
2. **Intermediate -** MLC's and ESU's will have limited knowledge on this system, but be able to coordinate supply logistics for deployed cutters.
3. **Depot -** The depot will perform Depot level maintenance for all repair items listed in the APL; maintenance will consist primarily of replacement of failed Lowest Repairable Units (LRC) and repairs to failed wiring. The APL lists the LRU's for depot ordering only.
4. **SMEF:** The Command and Control Engineering Center (C2CEN) is assigned SMEF responsibility for the Flight Deck Closed Circuit Television System. SMEF Responsibilities consist of resolution of System Trouble Reports (STR's), System Improvement Reports (SIR's), Engineering Change Proposals (ECP's), development of field changes, and overall system engineering. C2CEN provides technical liaison to field units through the C2CEN SMEF Desk, which can be reached at (757) 686-2156. Support calls and general SMEF Desk questions can be submitted via email at smefdeck@c2cen.uscg.mil. System documentation is posted on C2CEN's intranet site at http://cgweb.lantuscg.mil/c2cen/.

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